AMELING EN' 8 ERING LACQU FING R V 0 O m ž Ы RUST ZING AND ANODI POLISHING

MARCH, 1959

CONTENTS:

Copper-Nickel-Chromium and Corrosion Protection

Tests and Conclusions

Inventions and Patents

How to Protect Them

Composition and Application of Anodes

Types and Uses

How to Specify a Painted Finish

Some of the Factors Involved

Improved Fluorescent Paints Expand Their Engineering Uses

Compositions and Characteristics

Spray Booths and Oven on Stilts Solve Space and Quality Problems

A Novel Arrangement Described

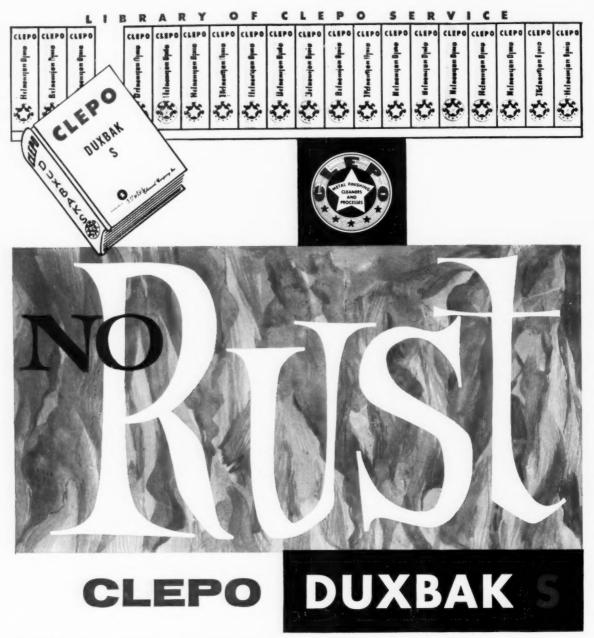
Finishing Pointer

Specific Gravity of Sulfuric Acid — Aluminum Sulfate Solutions

Science for Electroplaters
Sulfamic Acid

Complete Contents Page 41

Read and pass on -



A rusted surface can never be restored except by additional expensive operations. Treatment with low cost DUXBAK S prevents rust formation where it might normally occur in processing. DUXBAK S completely displaces water, leaving in its place an unbroken homogeneous film on the surface which fully protects the steel against rusting. Particularly critical points where rusting occurs are after machining, grinding, cleaning, deburring, pickling and during prolonged storage.

Easy to apply when protection is wanted

Easy to remove when finishing operations are scheduled

- 100% water-displacing rust-preventive
- Protects steel during storage and between operations

DUXBAK S has been standard for years in many plants for providing this much needed protection against RUST. Send for a sample of DUXBAK S and make your own comparisons. The record of this widely used rust preventive shows consistently superior results.

FREDERICK

GUMM Chemical Company Inc.

Insuradaerent coatings with EBONOL BLACK VELVEY

Photograph of the cupric oxide needles (magnified 6500x) produced by immersion of copper part in hot solution of Ebonol "C" Special.

Treating copper and brass surfaces with Ebonol "C" Special will insure high adhesion for almost every type of coating. This patented product of Enthonics Research forms thousands of jet black cupric oxide needles per square inch. Once these needles become imbedded in the coat or adhesive, and the coating sets, adhesion is tight and long-lasting. Lacquers, enamels and plastics are all bonded firmly to copper or brass surfaces when these surfaces have been pre-treated with Ebonol "C" Special.

Use Ebonol "C" coatings to achieve extremely low reflectivity on military equipment and optical parts. The coatings absorb oil, giving better lubrication of copper surfaces. They resist corrosion and produce an attractive finish with little dimensional change. Heat radiating and absorbing abilities of the surface are increased. Printed circuit manufacturers oxidize copper foil in Ebonol "C" Special before coating with adhesive and bonding to the plastic laminate. Result: double the bond strength.

Write for the complete story on Ebonol "C." We promise it will be immediately rewarding. Enthone, Incorporated, 442 Elm Street, New Haven, Connecticut.

SARCO

ENTHONE

A subsidiary of American Smelting and Refining Company

Now...it's easy to remove even

EPOXY

...with Oakite's NEW STRIPPER S.A.

Did you think epoxy finishes next to "impossible" to remove? It was a tough job. That was before Oakite developed Stripper S.A. Here's what it has been doing:

- 1 A 3/16" thick coating built up from layers of epoxy coating and wrappings of fiber glass was stripped from gun barrels by Stripper S.A. by overnight soak. Everything tried previously had failed.
- 2 Brass plated steel parts were stripped of their epoxy finish in a matter of minutes.
- 3 Workholding spindles and racks laden with at least 10 coats were bared to metal by a short soak. Paint hooks formerly burned clean are now soaked clean instead.

Oakite Stripper S. A. is safe for all metal surfaces except zinc and magnesium. This stripper needs no heat, has no flashpoint, rinses with water.

If you have an epoxy or other application that has defied stripping, you have a job for Oakite Stripper S. A. It's the latest in Oakite's broad line of paint strippers for every requirement. Write for details. Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.



Technical Service Representatives in Principal Cities of U. S. and Canada

METAL FINISHING is published monthly by Metals and Plastics Publications, Inc., 381 Broadway, Westwood, N. J., U.S.A.
SECOND CLASS POSTAGE PAID at the Post Office in Westwood, N. J. and New York, N. Y. Volume 57, No. 3, March 1959. Five dollars per year.

For 60 Years ... L'HOMMEDIEU...

year after year has manufactured Reliance Plating, Polishing Equipment, Supplies for Better and More Profitable Metal Finishing

RELIANCE PLATING BARRELS

Easy to Handle . . . Save Time and Money
Uniform Current Distribution
Plating Begins at Once

Lucite — Hard Rubber or Bakelite Cylinders Motor — Geared in Head Minimum Maintenance

> Write for Reliance Plating Barrel Specifications





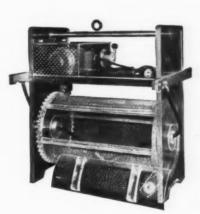
RELIANCE SELENIUM RECTIFIERS

Designed for all metal finishing operations.

High power factor and low ripple.

6 to 48 volts D.C.

Basic-self-contained or with Remote Control.



RELIANCE

Portable Plating Barrel

Built of extra heavy High Temperature Lucite for volume production and stability.

Cylinder: 10"x18" inside. Equipped with Reversing Switch to permit stopping and securing barrel for loading and/or unloading.

Chas. F. L'Hommedieu & Sons Co.

MANUFACTURERS OF METAL FINISHING EQUIPMENT AND SUPPLIES GENERAL OFFICE AND FACTORY

4521 OGDEN AVE.

CHICAGO 23, ILL.

Chas. B. Little Co. Newark, N. J. W. R. Shields Co. Detroit, Mich. Branches: Cleveland & Los Angeles



New machine for dipping processes...

Crown "M-P" Multi-Purpose automatic processing conveyor

Crown M-P (Multi Purpose) Conveyors are a new development in basic design and control that brings automatic dipping processing to all industry for multi cycle processing in plating—anodizing—painting—phosphatizing and rubber dipping operations. Using the basic "M-P" concept, machines can be built to meet your specific requirements by incorporating one or several of these important Crown features:

- Each carrier can be set for one of several different cycles.
- . One machine that can plate two or three different metals.
- Horizontal and oblique barrels and even racks can operate on the same machine.
- Rack and barrel work can be plated at two different voltages on one machine.
- Work can be plated at four different thicknesses at the same time.
- Size of parts can vary from 1/4 inch to 40 feet in length.
- Weight per station from ten to three thousand pounds.
- . Lifts from 12 inches to 12 feet.
- Rotation, tilting, or other auxiliary motion during transfer.
- Machines of this type have been at work in actual production for over 2 years.





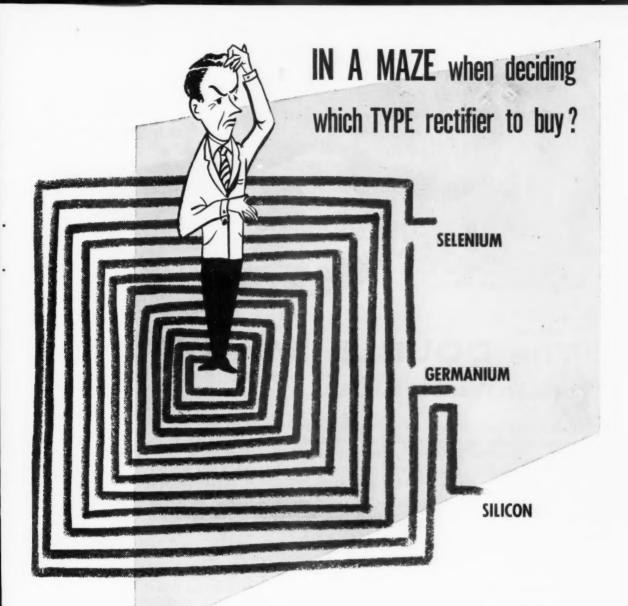






If your process includes a series of dips, you should know more about the Crown "M-P"...ask for our Bulletin M-P. Tell us your processing requirements and we will be glad to show you how the "M-P" can save you money.

CROWN RHEOSTAT AND SUPPLY COMPANY
1965 Pratt Boulevard • Elk Grove Village, Illinois



Why not call RAPID'S engineering department with your power requirements. Let us match your requirements with the right type rectifier.

Because each semi-conductor has advantages to offer, and because RAPID supplies all three, you can be certain of obtaining sound technical advice.

Call TA 8-2200 for reliable technical service.



THE NAMEPLATE THAT MEANS

"More Power to You!"

- 2881 Middletown Road



The DOUBLE IMPACT... of a UDYLITE IDEA

Project Alert, as a philosophy of re-awakening, of renewed enthusiasm, of mental alertness, has shown wonderful results since its initiation last fall. Many organizations have asked us for supplies of Project Alert folders and buttons so that they may introduce it to their people. Leading magazines and newspapers, too, have given Project Alert splendid support.

1. Project Alert, as a sound product promotion, has worked because each of the three product presentations has included a true specialized service, an economically sound value, and a new product.

Like the product presentations still to come, they are based entirely on *customer benefit*. Customer recognition of these values, measured by their response, has been excellent.

2. Adoption of the philosophy to your own organization will help you as surely as it has helped others. And keeping your eye on Udylite product presentations and their sincere true value offerings can only add to your profits.

If you want to adopt the Project Alert philosophy, we'll be glad to help you. And if you haven't seen our Project Alert product presentations, we'll furnish you copies on request.

Ask your Udylite sales representative, or write direct to us in Detroit

Redme

C. H. REEME, president

udylite corporation

detroit 11, michigan · world's largest plating supplier



Join the PROJECT ALERT CAMPAIGN now!

PROJECT ALERT AT WORK FOR YOU



- **FIRST:** Udylite introduced its plating barrel reconditioning and replacement plan. It has worked and is working, just as promised, for the many customers who have taken advantage of this service.
- **SECOND:** Udylite offered an unmatchable service for modernizing old rectifiers to give them the benefit of the latest high efficiency rectifier developments.
 - **THIRD:** Now, Udylite offers a no charge technical service for the inspection of your Udylite Full Automatic machines and the recommendation of what is needed to put them in top operating conditions.

THE PLAN AND THE PROMISE:

Your Udylite representative will call on you and offer this special service:

- 1. A factory-trained service man will call at your plant, at your convenience, to determine if your machines need service and/or parts.
- 2. If they are needed, he will give you, at that time, a quotation at the special low prices established for this Project Alert program.
- 3. On your acceptance of the quotation, parts will be shipped promptly from a special department at Udylite. When they arrive at your plant, the Udylite service man will return and supervise your people in their installation.

THE ADVANTAGES:

- 1. Complete machine inspection without charge to you.
- 2. Immediate and complete quotation, if work or parts are needed.
- 3. Udylite factory supervision in your plant.

All three Project Alert plans are working. And all their advantages are yours for the asking. Your Udylite man will be seeing you soon. But if you need prior service, write, wire or call us *today*.





corporation

detroit 11. michigan . world's largest plating supplier



A Timely Message on Public Relations

. . the most important relatives a business family can have

by Ben P. Sax

Chairman of the Board, American Buff Company

All American business plays a vital part, not only in the U.S. economy and standards of living, but in its culture as well. And culture includes understanding between man and idea, principle and concept, business and the individual.

The business family in any industry is a community family . . . with "relatives" widely differing in every respect. Our "public relations", the public with whom we work, are the most important relatives our business family can have. If they are unaware of the important part that your business plays in improving living standards and opportunity, you are wasting a powerful tool for building cooperation between you and these "VIP" relatives.

A planned Public Relations Program can do a real job of showing the everyday benefits which business helps to make possible ... showing how it contributes to the daily betterment of living conditions within its area.

We at American Buff believe that our man-to-man activities are as important as the quality of our product. And we try to tell the story in words that make people know that we are not only manufacturers, but, more importantly, human beings.

Sincerely, Say
BEN P. SAX



AMERICAN BUFFS ARE REGULARLY ADVERTISED IN FORTUNE MAGAZINE

every \$6,400
YOU SAVE IN
DEGREASING COSTS
IS WORTH A
\$100,000 ORDER!

Columbia-Southern TRICHLOR helps you save money

Pretax earnings average 6.4% or \$6,400 on each \$100,000 of product you sell after raw materials, sales expenses, overhead, and miscellaneous are deducted.* Every time you save \$6,400 in your degreasing costs, it is the equivalent of your net on a \$100,000 order.

Columbia-Southern is a foremost name in degreasing knowledge and experience, product quality, cost-saving operation. Our Technical Service specialists will be glad to examine your degreasing process and recommend ways in which you can effect savings.

If a Columbia-Southern representative has not yet reviewed your degreasing operation, his visit will more than likely save you money. So, why wait? Write today to "Trichlor" at our Pittsburgh address.

*Based on Manufacturing Corporation Statistics for the first half of 1958.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION A Subsidiary of Pittsburgh Plate Glass Company • One Gateway Center, Pittsburgh 22, Pa.





BELKE introduced the first filters for plating solutions more than thirty years ago.

Improvements perfected through the years and the consistent use of the finest developments in modern materials have kept BELKE Filters at the top—unequalled for simplicity of design, durability of materials and

ease of cleaning.

For example BELKE filter plates, the very heart of the filter, are machined from ageless, non-corrosive Plexiglas.

The unique interlocking design of filter plates and Plexiglas spacers, permits installation and removal plate by plate. Non-warping, non-flaking qualities of the filter plates simplify reassembly

and avoid costly replacements.

Flexibility in the use of filter bags and filter aids, freedom from priming problems, and ease of pre-coating all contribute to the smoothest, most dependable filter operation obtainable for plating solutions.

BELKE Portable Filters are available in sizes to 1000 gallons per hour.



BELKE Filter with Cover Removed

The simplest filtering assembly ever. One locking screw compresses the interlocking units into a rigid mass, which forms an unobstructed channel to the filtrate discharge pipe.

Releasing the locking screw releases the units for removal or inspection one at a time.

The use of Plexiglas plates and spacers assures light weight, easy cleaning, non-warping and ease of reassembly.

Filter bag inspection and replacement are simple one man operations.

Send specifications for quotation.

Whatever your filter requirements; stationary or portable, acid or alkaline, continuous filtering or other special equipment; send details today for the BELKE quotation.









* YOU GET THE NICKEL CONTENT YOU PAY FOR in Nuodex Nickel Sulphate and Nickel Chloride

Nuodex was the first and is still the only manufacturer to certify the metal content of metallic salts. This means that in your plating operations you are sure of the metal content and can calculate your needs and costs accurately. Nuodex Nickel Sulphate is high in purity, free flowing and completely soluble—insuring consistent performance.

Nuodex Nickel Chloride also benefits the user by its certified uniformity and its ease in handling from the special package.

All the Nuodex Metallic Salts are certified as to metal content. Inquire about Nuodex Nickel Formate, Nickel Carbonate, Nickel Nitrate, Cobalt Sulphate and other metallic salts. Remember, Nuodex is your continuous source of supply.

NUODEX

special purpose chemicals for industry

Fungicides • Nickel Salts • Organic Peroxides • Paint Additives • Stearates • Vinyl Additives NUODEX PRODUCTS COMPANY • ELIZABETH, NEW JERSEY

A Division of Heyden Newport Chemical Corporation

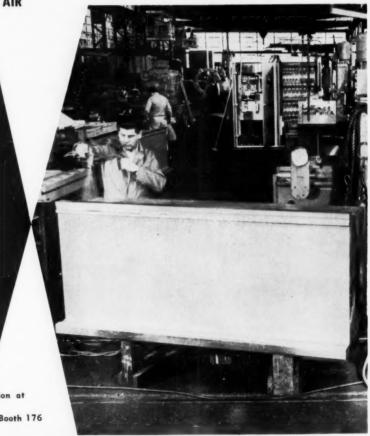


*SPRAY PAINTING WITHOUT AIR

The Morey Machine Company, Long Island City, N. Y., has eliminated costly production interruptions due to paint "overspray". Their machine tools, used throughout the world, are now finished with the modern spray coating process.... Nordson Airless Spray Painting. By eliminating air as an atomizing agent, this new painting method allows Morey's production personnel to continue their skilled functions even in the vicinity of the painting operations. Airless spray painting provides these cost cutting advantages:

- Paint savings as high as 50%
- Reduced exhaust requirements
- As high as 80% labor savings
- Decreased health and fire haz-
- Reduced auxiliary painting equipment requirements

See Airless Spray Painting on demonstration at
The Western Metal Exposition —
Les Angeles, Calif. — March 16-20, 1959 — Booth 176

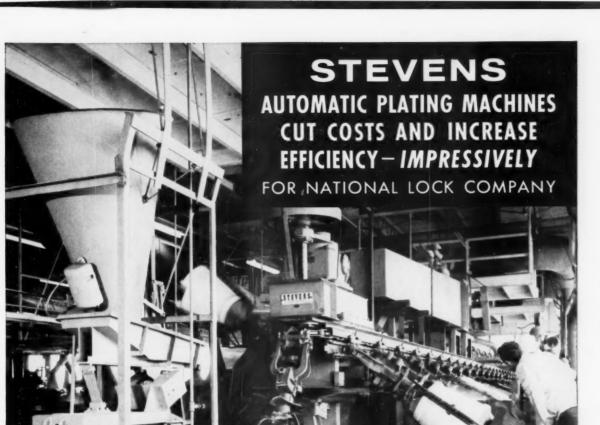


NORDSON CORPORATION

AMHERST, OHIO YUKON 8-4473 In Canada: 864 Pape Ave., Toronto, Ontario

write for airless spray painting brochure

THE BEST IN SPRAY COATING EQUIPMENT



Read what Paul Repka, assistant plant engineer for National Lock Co., Rockford, Ill., says about his company's Stevens automatic machines:

"When we installed our battery of three Stevens Automatic Plating Machines in 1957, we were rewarded by an immediate increase in efficiency and an accompanying reduction in plating costs. The machines keep up with demanding production schedules easily. And their noteworthy savings in material and labor costs have proved to us that for high-volume, low-cost metal finishing, Stevens Automatic is the right answer."

Just as Mr. Repka did, an ever-growing number of metal-finishing and plating executives are learning of the increased production capabilities and cost-cutting abilities of Stevens automatic plating equipment. If your present method of plating isn't giving you all you expect of it, contact your local Stevens sales representative now. Let him show you the automatic Stevens way to more profitable plating and processing.

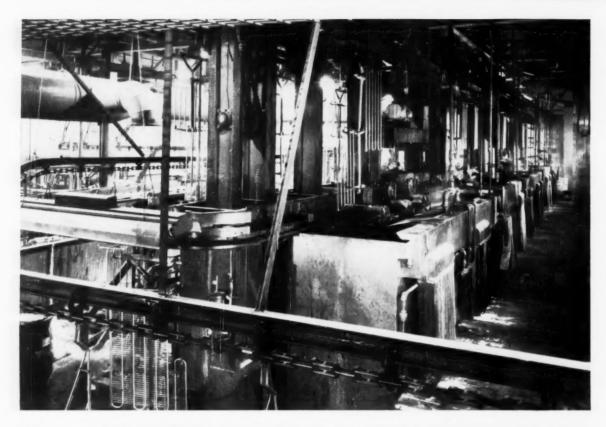
Remember - when you go automatic - go STEVENS

frederic b.

STEVENS, inc.

DETROIT 16, MICH

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)



New MEAKER "Uniline" plating machine steps up production at UNION STEEL

A REAL WORKHORSE ...

That's what Union Steel's production and engineering department says about their new Meaker "Uniline" machine. Presently, the machine is zinc plating evaporator shelves for refrigerator units at a driving rate of 350 pieces per hour . . . 23 hours a day . . . seven days a week. The Meaker "Uniline" machine has been at this steady grind since its installation . . and with no downtime at all as has been experienced with adjacent machines of other makes.

STRUCTURAL SOUNDNESS AND SIMPLICITY ...

These two factors are a prime requisite in any Meaker machine, spelling dollar savings plus superior controlled quality and increased production. "Meaker" is the keyword to better plating. Remember . . . before you buy just any machine, ask men like Mr. Ray Marshall at Union Steel why he says that the next machine he buys will be another Meaker . . . then decide on the best . . . Meaker, the name that stands for fine equipment, superior engineering, plus service.



THE CARRIERS . . . Full rackload is carried on steel rollers with permanently lubricated bearings. Electrical contacts on the carriers are positive in action due to constant load pressure and are easy and inexpensive to maintain. Current path from cathode rail to rack is short, minimizing voltage loss.

MEAKER METAL FINISHING EQUIPMENT Write for Free Bulletin U-658...

THE MEAKER COMPANY
1629 SOUTH 55th AVE., CHICAGO 50, ILL.



New product beauty and uniform coverage with CORVEL† vinyl "fusion bond" finishes







unretouched photos

Excellent coverage of edges, corners and projections-

finishes unmarred by sags, drips or bridging

CORVEL vinyl finishes are specially processed dry powders, formulated for use in the patented* fluidized bed coating process. These finishes give you the following outstanding advantages:

- Heavy finishes (approx. 0.010" to 0.032") obtained by a single dip—without solvents.
- Wire intersections and joints are thoroughly covered, have clean, neat appearance.
- · Wire section coating has good concentricity.
- Surface has outstanding color and gloss retention, extreme toughness, excellent resistance to corrosion and chemicals.

Thus, CORVEL finishes can give your products improved durability and appearance at minimum cost.

Process licensing is now readily available. A process license is automatically extended to the purchaser of CORVEL powders from National Polymer Products, Inc. upon payment of a small royalty added to each sales invoice. General licenses to use the patented process can be obtained from Polymer Processes, Inc. an affiliate company.

Investigate the advantages of CORVEL vinyl finishes. Details on the fluidized bed process and equipment are available. Other CORVEL finishes include cellulosics, epoxies, nylon, polyethylene, and chlorinated polyethers.

Write today for a copy of the new CORVEL Bulletin.

NATIONAL POLYMER PRODUCTS, INC. / Reading, Pennsylvania

West Coast facilities: The Polymer Corporation, Santa Ana, California

†Polymer Corporation trademark for finishing materials *U.S. Patent 2,844,489 and over 30 patents pending





metal cleaning report no. 1

case histories from your Dow Solvents Distributor



Aluminum headlight assembly being cleaned in vapors of Dow trichloroethylene.

DOW FIELD-LAB TEAM SOLVES DEGREASING RIDDLE

Bay City, Mich.—Manufacturer of auto parts reported faulty still was causing dirty distillate in his trichloroethylene degreasing operation. Dow field team went in, did thorough check of whole operation. Discovered not one, but three trouble spots: (1) Water separator on degreasing unit working improperly; (2) Excess water in stamping oil on parts being cleaned (Dow lab finding); (3) Faulty steam injection valve on still. Valve replaced, water separator repaired, and new stamping oil put in use. Plant now getting good cleaning action first time through vapor degreasing unit using Dow trichloroethylene. Key to solution was skill and thoroughness of trained Dow solvents team.



Time and time again, Dow solvents distributors help manufacturers improve cleaning and stripping operations. And for two good reasons: (1) Dow offers the widest line of chlorinated solvents for modern industry; (2) Dow backs its distributors to the hilt with technical information and on-the-job help. Chances are good that one of the many Dow industrial solvents can help smooth out your operations, too. Dow solvents are made to high purity standards and each is designed to do a specific job and do it well. For help on your metal cleaning problems, call on the nearby Dow solvents distributor.

THE DOW CHEMICAL COMPANY • MIDLAND, MICH.

NEW COLD CLEANER SAVES BIG DOLLAR

Detroit, Mich.—Expensive fluorinated cleaner was being used by manufacturer to remove paraffin oils from refrigeration compressors. Key requirement: clean parts without damaging insulation varnish on motor windings. Dow solvent team invited in. Observations pointed to Chlorothene (Dow 1,1,1-trichloroethane, inhibited). Compressors cleaned with Chlorothene and air purged immediately after. Lab tests proved Chlorothene cleaned effectively, safely, without damaging insulating varnish. Company switched to Chlorothene, effected dollar savings while getting safe, sure cleaning.

PERCHLOROETHYLENE KEY

Los Angeles, California—Nationally known lock manufacturer was having difficulty cleaning plated metal parts. Door handles and face plates were coming off trichloroethylene degreasing line with marring water spots. Dow called in on problem. Recommended switch to Dow perchloroethylene. Higher boiling point and longer cleaning action resulted in spotless parts. Lock maker now saving time, money, with efficient perchloroethylene degreasing.





FREE . . .
TECHNICAL SERVICE
on 24-hour notice

Your Dow solvents distributor will gladly help you with any problems you're experiencing with metal cleaning solvents. He'll have a trained solvents specialist en route to your plant within 24 hours after your call is received!

Ask your Dow solvents distributor for details.

STOP-OFF LACQUER STRIPPED FAST

Stratford, Conn.—Major aircraft engine manufacturer was having trouble removing stop-off lacquer used on steel and aluminum parts selectively plated. Parts were being soaked and rinsed in flammable thinner. Process was slow, results unsatisfactory. Dow solvents distributor suggested vapor degreasing with Dow methylene chloride. Parts were run through vapors, then rinsed with spray lance application of m.c. System worked. Lacquer stripped off clean in matter of minutes. Flammability hazard eliminated. Problem marked solved.

CHLOROTHENE®
TRICHLOROETHYLENE
PERCHLOROETHYLENE
METHYLENE CHLORIDE

See Your Dow Solvents Distributor First!

RIGHT with these proven AHCO Compounds



Lustralume No. 1

This outstanding new burnishing compound is a clear stable liquid readily soluble in water. It's non-toxic, non-flammable, mildly alkaline, and moderate foaming. Ideal for use in all conventional types of oblique or horizontal barrels where moderate foaming is permissible. Solutions are free rinsing and leave no undesirable films on the work. Properly cleaned surfaces emerge with a smooth brilliant lustre.



Ahcal Etch Cleaner No. 1

This powdered, concentrated, alkaline material produces an attractive, uniform etch in a very short time on all types of aluminum surfaces. It's non-dusty and its solutions produces the right amount of foam. The outstanding characteristic of Ahcal is its ability to dissolve large quantities of aluminum without forming undesirable scale or sludge. As a result maintenance problems are eliminated or alleviated.



Ahcal Deoxidizer

This compound is ideal for removing smut after cleaning and etching, and before painting. Its convenient powdered form make it safer than liquid acids and it gives off no dangerous or toxic furnes.



Ahcoloid Cleaners

No. 189—A non-etching alkaline soak cleaner for cleaning aluminum prior to anodizing and chemical processing.

No. LC-3—An emulsifiable liquid pre-cleaner . . . ideal for removal of oil, grease, and buffing residues from aluminum. It's non-corrosive and non-toxic.

No. 59-H-5—A non-etching alkaline cleaner for use in power washers, It's low foaming and has exceptional cleaning power.

LUSTREBRITE LIQUID 35—A new type of liquid soak cleaner developed specifically for removing buffing compound residues and fingerprints. It's an aqueous solution of non-toxic, non-corrosive, organic materials. It has no flash or fire point and it's non-fuming.

Write for Bulletins to



APOTHECARIES HALL CO.

DIVISION OF

THE HUBBARD-HALL CHEMICAL CO

WATERBURY, CONN.



Complete Versatility One-Man Operation!

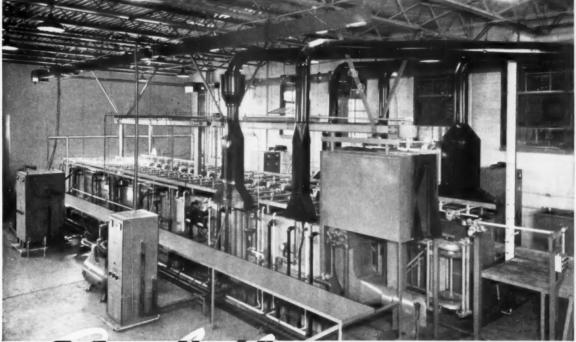


Photo courtesy General Finishers, Canton, Ohio

Cyclefler

AUTOMATIC PLATING & ANODIZING MACHINE

QUICK CYCLE CHANGING Simply change positions of pick-up heads on transfer truss and alter tank partitions to suit. No expensive time-wasting overhauls—no rebuilding or other alterations

NO CONVEYOR BREAKDOWNS New electro-mechanical control, and safety devices, positively prevent racks from jamming into tank sides keep load from dropping if power fails during work transfers

LOW HEADROOM All elevating mechanisms operate below top level of rack carrier

Pneumatic operation, optional

Hydraulic operation, standard

SELF-CLEANING CONTACTS Need practically no attention—insure positive six-point connections. Heavy duty design

EASILY REMOVED RACK CARRIERS Tank surfaces are kept clear—a big advantage when manual plating large workpieces, and when servicing

AUTOMATIC LOADING and unloading from doublespine racks is available if needed

DELAYED SET-DOWN ARRANGEMENT to work automatically with cycle, can be furnished where conversion coatings and bright dips are used

BY-PASSING can be built into machine where more than one cycle is required

-Mail Coupon Now-

LASALCO, INC

HOME OFFICE: 2820 LaSaile St. • St. Louis 4, Mo. • PRospect 1-2990 IN TEXAS: 2805 Allen St. • Dallas, Texas • Riverside 7-5814 Send complete information on fully automatic Cycleflex

Company

Street Address

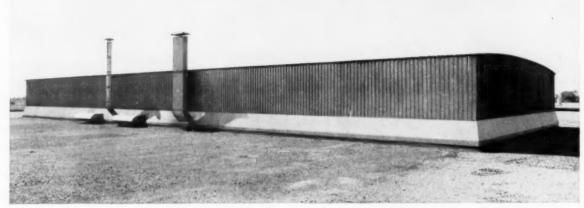
City, Zone, State

Signed

Attach to Company Letterhead

METAL FINISHING, March, 1959

Processing EQUIPMENT...



Mahon Dehydrating Oven with Controlled Dew Point Installed on the Roof of the Copeland Plant, Sidney, Ohio.

COMPRESSORS are Dehydrated, Sealed, Inspected, Tested, Painted, and Charged with Refrigerant on ONE CONTINUOUS CONVEYOR PRODUCTION LINE!



Mahon Three Conveyor Line Two-Stage Metal Parts Cleaning Machine—Another Unit of the Compressor Processing Equipment Installed at Copeland Refrigeration Corporation, Sidney, Ohio.

The High Temperature, Low Dew Point Dehydrating Oven illustrated above is part of the modern straight-line production facilities for processing Compressors in the Copeland Refrigeration Corporation's plant, Sidney, Ohio.

When you need Processing Equipment or Special Production Equipment of any kind, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering of equipment that will produce the desired end result at minimum cost per unit processed.

THE R. C. MAHON COMPANY • Detroit 34, Michigan Sales Engineering Offices in Detroit, New York and Chicago

Engineers and Manufacturers of Complete Conveyorized Finishing Systems: Metal Parts. Washers, Metal Cleaning and Rust Proofing Machines, Conveyorized Cleaning and Pickling Machines; Dry-Off Ovens, Spray Booths, Electrostatic Spray Enclosures, Flow Coaters, Dip Coaters, Finish Baking Ovens, and Point Stripping Equipment; Core Ovens, Soldering Ovens, Dehydrating Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium; Dust and Fume Control Installations, and Many Other Units of Special Plant and Production Processing Equipment.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-659

the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

MAHON

Your finest work starts with Federated Plating Materials: No Federated plating material is approved for marketing before it has proven its quality through continuing Asarco research. Thus top performance is assured.

This policy of research and testing has rewarded the plating industry with Conducta-Core lead anodes which have greater throwing power, yet last three or four times longer than other lead anodes. Cadmax, addition agent for cadmium plating, is another example of superior materials. So too is Zimax for zinc plating, Nimax, a nickel plating brightener, and new Conmax, a conversion coating for cadmium and zinc plated parts. All do a better job at lower cost.

Your Federated representative or distributor will be glad to document this superiority. And you'll prove it for yourself when you standardize on Federated materials. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF



low cost bright nickel plating; Conmax, a conversion coating, for cadmium and zinc plated parts.



Harshaw's research and development laboratory solved the problem of plating nickel on nickel. This, coupled with the use of a sulfur-free nickel plate and a bright nickel from a compatible bath, has made possible a Duplex deposit with unequalled corrosion resistance.

EXCELLENT CORROSION PROTECTION ACHIEVED
THROUGH USE OF A SULFUR-FREE DEPOSIT

The Harshaw Chemical Company after years of research and development work was the first to find that a sulfur-free nickel offers greater corrosion resistance. This fact led to the development of the Harshaw Perflow nickel plating process. Further research showed that use of the sulfur-free Perflow nickel deposit as a base coating, followed by a bright nickel deposit from a compatible bath, would give a Duplex deposit with a further improvement of corrosion resistance. Performance data, by both accelerated tests and outdoor exposure, from leading automobile manufacturers and parts suppliers indicate that the Harshaw Perflow-Perglow Duplex nickel plate is comparable to and frequently better than, buffed gray nickel and is unequalled by any bright nickel.

MANY OTHER ADVANTAGES

- Exceptionally high plating speeds
 —with air or mechanical agitation.
- 2. Excellent Chrome Coverage.
- 3. Unsurpassed Leveling Characteristics.
- 4. Outstanding Brightness.
- 5. High Tolerance to Impurities.
- 6. Excellent Adhesion.
- Excellent Ductility at Full Brightness.
- Simplified Control Stable over extended periods of operation.
- 9. Controlled Stress.
- Uniform Protective and Decorative plate on both steel and zinc die castings.

THE HARSHAW CHEMICAL CO.

1945 EAST 97TH STREET

CLEVELAND A. OHIO

Chicago • Cincinnati • Cleveland • Detroit • Houston Los Angeles • Hastings - On - Hudson • Philadelphia • Pittsburgh



for mirror-bright gold and rhodium plating



ATOMEX® is a 24k gold immersion solution that permits the deposition of a thin, dense, uniform layer of 24k gold on printed circuits, trophies, costume jewelry, lamp components, clock assemblies, photograph frames, bottle caps, radio knobs, metallized plastics and many other objects, by means of a simple bath. The Atomex procedure is more permanent and less expensive than electroplating of comparable thickness. Costly analytical control is unnecessary.

RHODIUM Plating Solution . . . is ideal for putting a decorative finish on many types of jewelry, and for electrical and electronic applications. It has a hard, brilliant white, non-tarnishable, highly reflective surface and is extremely resistant to corrosion. It gives greater sales appeal to any jewelry on which it is used. A complete line of Rhodium plating solutions are available.

CHEMICAL DIVISION • 113 ASTOR STREET NEWARK, N. J.



bright silver plating process

Here is the most efficient, simple procedure to produce mirror-bright silver plate, finished directly—through a complete range from flash to heavy deposit. It is being used with outstanding success for all types of jewelry and hollow ware. The procedure is easy, economical and non-critical—with little or no polishing required. Silva-Brite is a clear, water-white solution, enabling the operator to observe work as it is being plated. Uniformly good results are attained with current densities ranging from 10 to 40 amperes per square foot. Normal room temperature operation minimizes fumes and tendency toward both decomposition. Send for descriptive data together with detailed plating procedures.

AMERICAN PLATINUM & SILVER DIVISION
231 N. J. RAILROAD AVENUE, NEWARK, N. J.

CHEMICAL

ENGELHARD INDUSTRIES, INC.

EXECUTIVE OFFICES:

113 ASTOR STREET . NEWARK 2. NEW JERSEY

AMERICAN
PLATINUM
& SILVER
DIVISION

BOMESTIC BIVISIONS: AMERICAN PLATINUM & SILVER DIVISION, AMERSIL QUARTZ DIVISION, BAKER CONTACT DIVISION, BAKER DENTAL DIVISION, BAKER SETTING DIVISION, BAKER PLATINUM DIVISION, CHEMICAL DIVISION, EAST NEWARK INDUSTRIAL CENTER, HANDVIA LAMP DIVISION, HANDVIA LIQUID GOLD DIVISION, INVINSION, DESEARCH AND DEVELOPMENT DIVISION, WHISON DIVISION, WHISON DIVISION, WHISON DIVISION, HAND DEVELOPMENT DIVISION, HAND DIVISION, COMPANIES OF GUEBE, LTD. HONDISTRIES ARBORITATED COMPANIES AND INDUSTRIES ARBORITATED COMPANIES AND ALLES PRECIOSOS S. A. BOCGOTA, DIVIDUSTRIES OF GUEBER DIVISIONS AND ALLES PROBLEMENT OF SOUTHERN AFRICA, LTD. JOHANNESBURG. ASSOCIATES COMPANIES ARM TIMEST INDUSTRIES LTD., SOUTH AFRICA, AZOPLATE CORPORATION, CHARLES ENGELHARD, INC., NUCLEAR CORP. OF AMERICA, INC., U.S.A.



A BETTER WAY

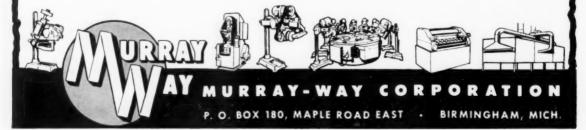
Many of the country's top manufacturers have turned to Murray-Way for help in planning and producing better time and cost saving equipment for their production lines.

Murray-Way's engineering skill and ingenuity are well known to those responsible for smooth, dependable production-at-afigure, in today's stream-lined manufacturing plants.

Whether you require one of our standard

pieces of equipment or a complete, specially engineered, fully automatic production line, Murray-Way's vast experience and modern production facilities are at your service.

Fresh ideas founded on experience and using dependable, basic components proved right by years of actual service are what we offer. We have helped many fine companies to produce more competitively. Perhaps we can help you. We invite your inquiry.



GOLDEN AGE

FOR ALUMINUM!

PFIZER OXALATES CAN HELP YOU ACHIEVE BETTER LIGHT-FASTNESS, MORE UNIFORM COLORING

• In the fast-growing field of colored aluminum, you can develop important sales advantages with PFIZER OXALATES.

In making gold colored aluminum, particularly, oxalates will give you improved light-fastness and uniformity. Coloring is accomplished by precipitating iron oxide in the aluminum oxide coating from solutions containing ferric oxalate or ferric ammonium oxalate. Shades, from yellow to brown, can be obtained readily by varying the processing technique.

Why not investigate the big profit potential in producing better colored aluminum through the use of PFIZER OXALATES? Write for further technical information on PFIZER OXALATES.

Manufacturing Chemists for over 100 Years



CHAS. PFIZER & CO., INC. Chemical Sales Division 630 Flushing Ave., Brooklyn 6, N. Y.

Branch Offices: Chicago, Ill.; San Francisco, Calif., Vernon, Calif. Atlanta, Ga.; Dallas, Texas

Related to this field is Aluminum Company of America
Patent No. 2,290,364, and possibly others.



GET ALL THE ANSWERS TO YOUR FINISHING PROBLEMS

at the FIFTH INDUSTRIAL FINISHING EXPOSITION!

(Held in conjunction with the GOLDEN JUBILEE CONVENTION of the AMERICAN ELECTROPLATERS' SOCIETY)

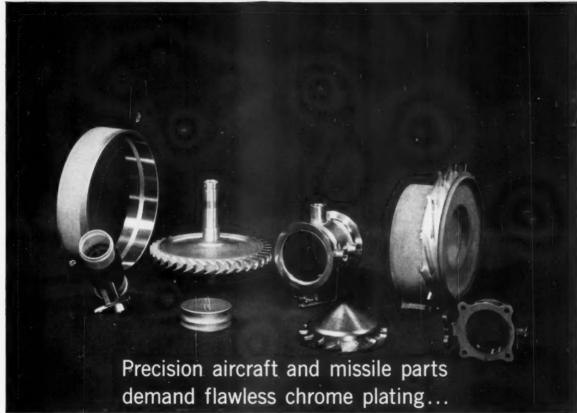
The finishing experts will all be under one roof next June. In Detroit, at the Detroit Artillery Armory, from June 15 to 19, at the Fifth Industrial Finishing Exposition!

Take your problems to them. Get expert help . . . at the largest display of finishing equipment, materials and processes ever assembled under one roof.

Make a list of your plating problems. Take it to Detroit with you. See the men who man the booths. The experts with professional, up-to-date help for you. They'll be there to demonstrate the right way to solve your problems.

If you want more information on the Fifth Industrial Finishing Exposition now, ask the exposition chairman:

HOWARD J. McALEER 3171 BELLEVUE AVE. DETROIT 7, MICHIGAN



Plating must be perfect on these aircraft and guided missile components, made according to rigid government specifications. Precision

Plating Co. of Somers, Connecticut, uses Mutual Chromic Acid for high plating accuracy—and dependable product performance.

For the best chrome plating use

MUTUAL low-sulfate CHROMIC ACID

Experienced platers working with close tolerance specifications have found the best way to maintain accurate control of the acid-sulfate ratio in the plating bath is to use Mutual low-sulfate Chromic Acid.

Mutual Chromic Acid is always 99.75% pure or better. Sulfate content never exceeds 0.1%. Rigid Mutual quality control guarantees uniformity of the product—a safeguard against plating difficulties and expensive rejects!

For further information about Mutual Chromic Acid, send today for "Chromium Chemicals." This booklet contains useful technical information about the entire line of Mutual Chromium Chemicals. The Mutual Technical Service Staff will also be pleased to offer expert help.

Mutual chromium chemicals

Sodium Bichromate Sodium Chromate Chromic Acid Potassium Bichromate Potassium Chromate Ammonium Bichromate

Koreon (one-bath chrome tan)

SOLVAY PROCESS
DIVISION
61 Broadway, New York 6, N. Y.



MUTUAL chromium chemicals are available through dealers and SOLVAY branch offices located in major centers from coast to coast.

SOLVAY PROCESS DIVISION

Dept. 9-39, 61 Broadway, New York 6, N. Y.

Please send me Bulletin #52—Chromium Chemicals—Their History, Properties and Uses.

NAME POSITIO

COMPANY

STREET.

CITY_____ZONE___STATE____

HERE'S YOUR REWARD

for telling us what you want in brighteners--



ISOBRITE PLATING BRIGHTENERS

Now—28 ISOBRITE BRIGHTENERS For Zinc, Cadmium, Copper and White Brass HAVE THE FOUR BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what you wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 ISOBRITE Brighteners with these most-wanted features:

1. LONGER LIFE

Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations,

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

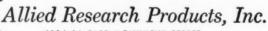
Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.

4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass... an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There is a difference!

Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies". Or, write for technical data and product list giving details of your operations.



4004-06 EAST MONUMENT STREET
BALTIMORE 5, MARYLAND

Manufacturers of IRIDITE®, IRILAC^{T.M.}, ARP® Brighteners and Plating Chemicals—West Coast Licensee: L. H. Butcher Co.

Announcing...

Improved TUMBLEX T barrel-finishing abrasive

...<u>harder</u>...lasts <u>longer</u> ...saves more



Greater hardness now adds greater durability to Norton TUMBLEX "T" abrasive.

That's why you can count on this revolutionary barrel-finishing abrasive for greater staying power than ever before — and longer lasting ability to deliver its famous "Touch of Gold" advantages like the following:

Available in six sizes, the uniform triangular shape of TUMBLEX "T" abrasive prevents wedging in recesses ... Made of bonded ALUNDUM* abrasive, it cuts fast, without cutting compounds ... By providing maximum.

mum surface contact it shortens tumbling time cycles and increases barrel payloads . . . It wears evenly, and when reduced in size it can be used for parts requiring a smaller abrasive.

Send your samples of parts — large or small, simple or intricate — to our Sample Processing Department. We'll barrel finish with the most suitable TUMBLEX type abrasive for your work — "A" (random shaped ALUNDUM aluminum oxide), "T" (bonded ALUNDUM abrasive triangles), "S" (bonded ALUNDUM abrasive spheres), or "N" (natural

stone) — and tell you exactly what's needed to improve your product quality and cut your finishing costs. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

G.350



Making better products . . . to make your products better NORTON PRODUCTS Abrasivas · Grinding Wheels · Grinding Machines · Refractories · Electrochemicals — BENR-MANNING BIVISION Coated Abrasivas · Sharpening Stoses · Pressure-Sensitive Tapos

Specify the No. 20-RD



A Sisal Finger-Buff* by Churchill

FLEXIBILITY never before achieved in a sisal buff!
In addition to the flexibility of each buff finger, the complete freedom of the sisal fibres within each finger gives the utmost in flexibility. The #20-RD is ideal for work involving curved surfaces and recesses.

FASTER cutting action that's positively unbelievable!

This #20-RD is one of the fastest-cutting buffs ever developed, because only the raw ends of each sisal fibre are in contact with the work, and they pick up and retain the cutting compound better.

LONGER wearing qualities hitherto unequalled!

Many foremen have found the wearing qualities of the #20-RD to be unmatched by any other sisal buff.

REMARKABLY smoother finish now possible!

Due to the exclusive use of first-quality sisal twine, especially processed and tightly twisted, the #20-RD produces a smoother finish than ever before possible.

Write Churchill your problem

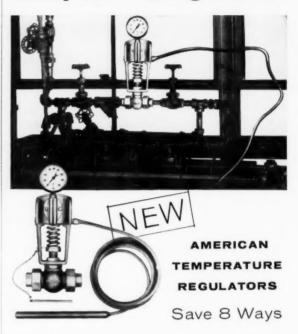
Solving "every-day" and "specialized" buffing problems has been Churchill's *only* business for 21 years. Originator of the Finger-Buff*, Churchill has developed and carries in stock a Churchill Finger-Buff* for nearly every buffing, polishing and coloring operation.

'The trade's attention is called to United States Patent No. 2.724.937, Issued November 29, 1955, to George R. Churchill covering the cloth-covered sisal buffing wheel manufactured by George R. Churchill Company, of Hingham, Massachusetts, exclusive Heenee, and marketed under its trade-mark, "FINGER-BUFFS", Reg. U. 8, Pat. Off.



	Mass.	MF-359	alalon
RE	PRESENTATIVES I	N PRINCIPAL CITIES	
Please send	me FREE catalog	g of Churchill Finger	Buffs.
Name	***************************************	Title	
Firm	***********		***************************************
Street	***********		
City		Zone State	***************************************
· My special	buffing problem	iš	

Cut your Plating Costs



Hold your plating tank temperatures within closest possible limits. Use fast-acting, self-operated American Temperature Regulators and get these advantages:

- 1. Accurate temperature control
- 2. Lower first cost
- 3. Save on installation
- 4. Reduce maintenance
- 5. Reduce rejects and costly reworking
- 6. Prevent breakdown of the solution
- 7. Stop overheating and boil off
- Peak performance from high-production conveyorized equipment

Low-cost American Temperature Regulators have standardized parts and unitized assembly. Installation costs less. No compressed air or electricity needed. Maintenance is practically nil. Temperature adjustment and repeat setting take but a few seconds. Dial thermometer accurately indicates the tank temperature; can be faced for easiest reading.

You profit more from continuously uniform, highquality plating. Invest in money-saving American Temperature Regulators. Sizes: ½" to 1½". Temperature Range: 110/220° F. standard. Temperature System: Bulb and line enveloped in plastic for longer service life. Bellows is Neoprene-protected against corrosion. Valve: Bronze body with stainless steel seat and disc. Ask for Bulletin 115.

Phone your industrial supply distributor for counsel, service, and prompt delivery from his local stocks.



AMERICAN TEMPERATURE REGULATORS
A product of

MANNING, MAXWELL & MOORE, INC.

Consolidated Ashcroft Hancock Division: • Stratford, Connecticut In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario Another new Wyandotte research-developed



metal-cleaning product!

NEW NORDALL emulsion cleaner locks out rust safely!



Here is a remarkable new emulsion cleaner that protects against rust longer — and without fire hazard, too!
. . . Wyandotte's New Nordall®!

Designed for spray cleaning steel, cast iron, and other metals either hot or cold, New Nordall protects for up to six weeks in plant atmospheres. Perfectly suited for rust prevention between machining operations!

Non-evaporating even at high temperatures, New Nordall is non-foaming in high-pressure, turbulent washers. And New Nordall has a higher, very safe flash point — over 300° F! And it's nontoxic and essentially odorless,

For details of this extraordinary rust-proofing emulsion cleaner, call in your Wyandotte representative soon. TODAY, perhaps? Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.

Other new Wyandotte products

MIL-ETCH®—Caustic-type aluminum etchant eliminates scale, produces bright matte finish, reduces maintenance.

MAXAMP*-Free-flowing, 100%-soluble steel electrocleaner offers maximum detergency, superior smut removal. Also used for zine phosphate removal; chromium-plate stripping.

FERLON®—Alkaline derusting compound removes rust, light scale, oil, grease, paint, smut without harm to ferrous metals.

BUFSOL—The all-soluble product that lets you remove stubborn buffing compounds the modern, trouble-free way—without solvents.

*TRADEMARK



The Best in Chemical Products for Metal Finishing

ACME

Automatic Polishing and Buffing Machines provide dependable solutions to problems of:



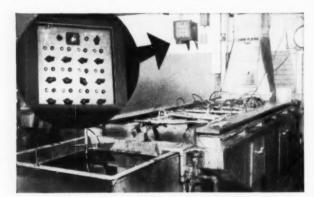
POLISHING
BUFFING
GRINDING
WIRE BRUSHING
DE-BURRING
MICROFINISHING



ACME

MANUFACTURING COMPANY . 1400 E. 9 MILE ROAD, DETROIT 20, (FERNDALE) MICHIGAN

BUILDERS OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY



AT CURTISS-WRIGHT A

WATER

SAVINGS...

OVER A SIX MONTH PERIOD

THROUGH THE USE OF INDUSTRIAL INSTRUMENTS'

AUTOMATIC RINSE TANK CONTROLLER

Proof-positive! Actual production tests under normal operating conditions over a six month period using a Solu Bridge Control Unit produced a 96% savings in water usage in the plating department of Curtiss-Wright.

Another outstanding case history of tremendous savings in water and dollars when Solu Bridge Control Units are installed. Solu Bridge Control Units consist of conductivity cell and

solenoid valve for each rinse tank with either individual or central control and measuring unit. Fresh water is added automatically whenever conductivity of water exceeds preset level.

Contact your local supplier today, or write directly to us for complete details on how this low-cost, economical to operate system can save you many hundreds of dollars in water and sewage bills annually.



Industrial Instruments inc.

89 Commerce Road, Cedar Grove, Essex County, N. J.



SEYMOUR SMITH

GARDEN TOOLS

Here's a line of brand new, modernly styled garden shears with built-in consumer appeal. And the gleaming finish of the high alloy tubular aluminum handles is the result of modern finishing set-up....Lea Liquabrade on a Harper Automatic Buffer. Seymour Smith estimates a saving of at least 30% over other methods of finishing.

Today's consumer is finish conscious...he wants and gets a finish that looks good and is durable.

Today's finishing department must produce such a finish, at high piece speeds and at low cost. An automatic or semiautomatic buffing system using Lea Liquabrade will produce just such a finish for your products.

For finishes with Appeal, come to LEA of Waterbury. Write us today for further information on Lea finishing methods and compositions.



Quality Products

16 CHERRY AVE.

WATERBURY 20, CONN.

Lea-Michigan, Inc., 14459 Wildemere, Detroit 38, Mich.

Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road, Scarborough, Ontario, Canada

Lea Mfg. Company of England, Ltd., Buxton, England

Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y. Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

Are you interested in plating specialties?
SEE THE OTHER SIDE OF THIS INSERT





The Best GOLD PLATING Formulation for Plating Electronics Parts!

...a simple production test will prove it. We're not often given to superlatives but this AURO GLO really is something! You should check its values for yourself. No elaborate preparations or change-over procedures are necessary to put AURO GLO into your plating setup so why not order a sufficient quantity to test and see if it doesn't bring to your production the following advantages:

- bright deposits for all thicknesses of plate. Auro Glo deposits do not merely duplicate the brightness of the metal as do conventional bright cyanide golds but rather 'build' brightness.
- m wide bright plating range (0-50ASF) permitting trouble-free rapid deposits.
- 24 karat or alloy deposits.
- 3 to 4 times greater hardness yet with far more ductility than deposits from conventional cyanide bright gold.
- heavy build up with electro-formed deposits that are mechanically workable.
- greater economy because through exceptional hardness and wear resistance, thinner deposits are permissible.
- \blacksquare dense, porosity-free deposits, passing all tests of major electronics parts manufacturing.
- no spotting out or bleeding out even at elevated temperatures or prolonged storage.
- exceptionally stable bath; simple to use.
- excellent solderability.

For those interested in gold for decorative use, Auro Glo offers for the first time Hamilton Shades in a gold for heavy deposits.

As with all Lea-Ronal developments, Auro Glo has been production-tested for well over a year prior to this announcement. It is the superior gold plating formulation. If you electroplate gold, test the Auro Glo process.

Lea-Ronal Inc

Sales and Manufacturing Plant: 237 East Aurora Street, Waterbury 20, Conn. Main office and Laboratory: 139-20 109th Avenue, Jamaica 35, N. Y.

Are you interested in Buffing, Polishing and Burring Specialties? SEE OTHER SIDE OF THIS INSERT.

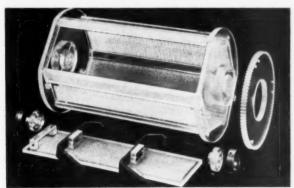


MORE GUTS

for tough lines!

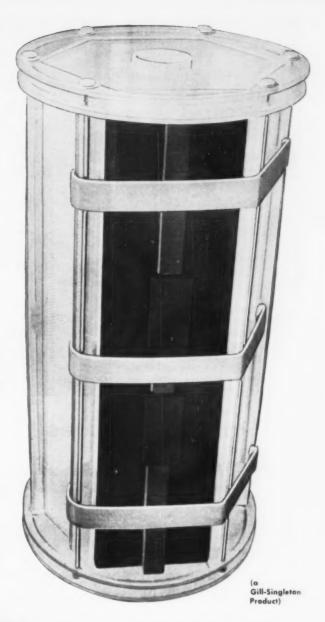
New G-S "Trussed-Rib" All-Bolted Cylinders

Temperatures to 220°F. Solutions others can't tolerate! Loads to 275 lbs. Bigger pay loads! Safer! 100% Replaceable Parts. Do it yourself with ½" wrench! Heavy 2" Sq. Ribs. More rugged! Better tumbling! 17½% More Perforations. More circulation! Stainless Trusses. G-S XL-12 coated. 3 times better! H-T Plexiglas, G-S Polydur, Tempron — any combination! Fits All Makes, any age, type, size superstructures!



G-S Mod. SUN — all sizes — All-Welded (shown) or Trussed-Rib

Also G-S cylinders, Trussed-Rib or All-Welded for all makes, sizes, types, ages, superstructures.



Replace Your Cylinders with G-S! Outperform All Other Makes 3-to-1

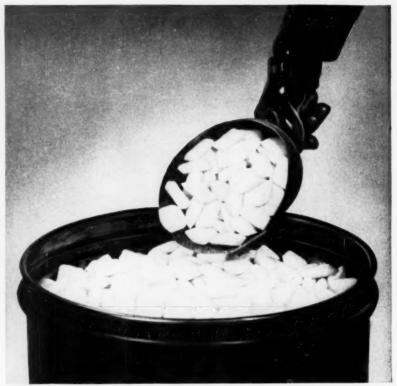
Tough lines in hundreds of plants prove G-S superiority. Cut maintenance 2/3. Without exception, G-S cylinders stand up where others fail. The "guts" to take punishment are built-in. "Trussed-Rib" or "All-Welded", G-S is heavy-duty engineered from head-to-head; materials technology and construction principles most imitated in plating today. Inquire now about G-S Cylinders to fit your equipment. Also: G-S "Cogged-V-Belt" Drive Cylinder-Superstructures for your tanks, G-S "Cogged-V-Belt" Drive Barrels (complete with tanks), G-S Liners, Hoods. Motor Drives, Dryers, Chute Loaders, etc. Send for bulletins with price lists.

The G. S. Equipment Co.

15583 Brookpark Rd., Cleveland 35, Ohio, CLearwater 2-4770



ALL-PURPOSE "CYANOBRIK" is shipped in full-open-head drums and is made in the form of 1-ounce pillow-shaped briquettes, convenient for measuring small quantities. Dusting is minimized, and accidental spillage can be cleaned up quickly and safely. It can be used in all sodium cyanide applications...including case hardening.



This is all-purpose "Cyanobrik" sodium cyanide.

Du Pont announces...

All-purpose Cyanobrik® -two convenient forms

All-purpose "Cyanobrik" in briquette form can be used in all sodium cyanide applications—including case hardening



JUST A TWIST OF A WRENCH unlocks the full-open-head drums used to ship all-purpose "Cyanobrik" and new "Cyanogran" M. Drums can be easily reclosed to provide full protection for unused contents.

Now you can use all-purpose "Cyanobrik" efficiently in *all* known applications for sodium cyanide, including plating, case hardening and chemical manufacture. The reason—a new manufacturing process at Du Pont's modern Memphis, Tenn., plant has succeeded in making "Cyanobrik" lower in moisture content and more resistant to moisture than ever before.

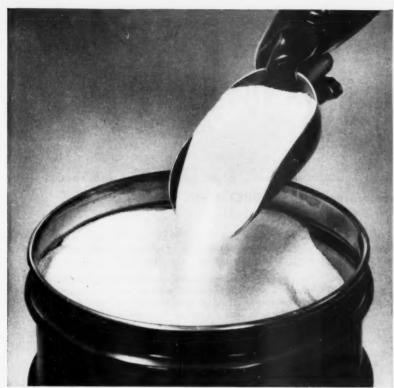
All-purpose "Cyanobrik" is guaranteed 97% minimum sodium cyanide. Maximum impurities are held so low you get an *extra pound* of active cyanide in every 100 lbs. you buy. And because it can be used in *all* applications, all-purpose "Cyanobrik" can help *you hold inventories down, simplify your purchasing*. Look at these high-quality specifications:

NaCN-97% min.; NaCl-0.2% max.; Sulfides as S-0.0005% max.

For more information just give your local Du Pont Distributor

DISTRICT AND SALES OFFICES:

Baltimore 2	Chicago 46.7250 N. Cicero Ave., Lincolnwood
Boston 10	
Charlotte 1	Cleveland 20 11900 Shaker Blvd.



This is "Cyanogran" M sodium cyanide.



EASY-TO-DISSOLVE "CYANOGRAN" M has the same high purity of all-purpose "Cyanobrik"—97% minimum sodium cyanide. It passes through a 10 mesh screen, but not a 50 mesh screen . . . is easy to handle because fines and dusting are climinated. "Cyanogran" M is also shipped in full-open-head drums.

and new Cyanogran M of sodium cyanide 97%

New "Cyanogran" M, a granular easy-to-dissolve form of all-purpose "Cyanobrik" sodium cyanide—at no extra cost!

"Cyanogran" M was developed by Du Pont specifically for dry compounders who require a uniform particle size and for those who desire sodium cyanide in a more rapidly soluble form. It is controlled in size during manufacture so that it will pass 100% through a 10 mesh screen and will be retained by a 50 mesh screen. Result: "Cyanogran" M is easy to handle due to absence of fines and dusting.

"Cyanogran" M and all-purpose "Cyanobrik" are sold at the same low price. Both are made at Du Pont's modern Memphis, Tenn., plant—a reliable domestic source of supply for you. Du Pont and its conveniently located distributors assure you prompt delivery. Here are the specifications for "Cyanogran" M:

NaCN-97% min.; NaCl-0.2% max.; Sulfides as S-0.0005% max.

a call, or write your nearest Du Pont District Office listed below.

TECHNICAL HELP FOR YOU

Du Pont's experts are always ready to provide on-the-spot service. They're backed by the facilities of Du Pont's new 2-million-dollar sales-service laboratory to help solve your problem.

E. I. du Pont de Nemours & Co. (Inc.) Electrochemicals Department Sodium Products Division Wilmington 98, Delaware



BETTER THINGS FOR BETTER LIVING



Process automation's most revolutionary development solves your biggest problem:

"CAN I AUTOMATE?"

ABBEY-Matic's third installment of straight answers to your pertinent questions. Here's proof you can — and should — be automated with an ABBEY-Matic right now.

Q: "Can ABBEY-Matic's revolutionary-type systems for fully automating barrel and rack plating as detailed in your two previous question-and-answer ads, be maintained without bigh-priced electronic experts, etc.?"

A: Yes! All controls are simple electro-mechanical; not electronic. Master panels are just convenient locations for timers, central power, and hydraulic power. Each station (single or multiple) is wired as modular unit with its own control box and limit switches. Know one, and you know them all in any arrangement.

Q: "Is ABBEY-Matic built for reliable continued heavy-duty use, with minimum maintenance and attention?"

A: Yes! Steel parts are epoxy-coated, castings are ductile iron and coated. Moving parts are on sealed anti-friction bearings — no sliding friction. Electrical components are the best available for each purpose and protected in water and oil-tight enclosures. Hydraulic system has steel tubing and heavy-wall pipe; no hoses, no moving cylinders. Solenoid valves rated for continuous duty. Modular design and construction features 100% interchangeability of parts; "spares" for one station will fit entire system.

Q: "Briefly, what does ABBEY-Matic offer me in basic advantages over 1. manual set-ups; 2. other 'automatics'; 3. combinations of both?"

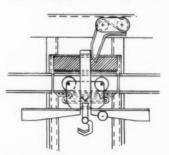
A: ABBEY-Matic is the logical evolution from all three methods — the first in metal finishing to be a TRUE EXPONENT OF MODERN "AUTOMATION", the technology of automatic manufacturing. Not simply plating or anodizing "machines", restricted by fixed capacities and other limitations, but FULLY AUTOMATED MULTIPLE PROCESSING SYSTEMS producing OPTIMUM results as dictated by YOUR changing requirements. The numerous contributing factors are detailed in technical literature available at your request. Let ABBEY engineers help you analyze and compute your real potential based on ABBEY-Matic's unprecedented production standards. Inquire now!

ABBEY-Matic Dial-Cycle Selection Flexibility Fully Automated



Dial-the-Cycle on the carrier — your choice of processes by a simple "twist of the wrist."

ABBEY-Matic Patented Interchanging Track Segments



Supplies missing link to full automation — carrier "leap-frogging", station "by-passing", etc.

Ask your equipment dealer or write direct to:



37-01 48th Ave., Long Island City 1, N. Y. RAvenswood 9-0592

Exclusive Distributor: ENTHONE, Inc.
Div. Amer. Smelting & Refining Corp., New Haven, Conn.
REPRESENTATIVES:
Austin F. Fletcher, Inc., Barlow Rd., R.D. 6,
Binghamton, New York

R. O. Hull & Co., Inc., 1300 Parsons Ct., Cleveland 16, Ohio R. O. Hull & Co., Inc., 3136 Hilton St., Ferndale, Mich. Ardeo, Inc., 5000 W. 73 St., Chicago 38, III. Armalite Co., Ltd., Crystal Arts Sq., Toronto 6, Canada



POLISHING AND BUFFING . BARREL FINISHING . CLEANING PLATING . ANODIZING . RUST PROOFING . LACQUERING & ENAMELING

MARCH, 1959

Volume 57 No. 3

FFATURES

Editorial — A Golden Anni	versa	ry	43
Copper-Nickel-Chromium a By A. H. Du Rose and W. J. Pierce	nd C	orrosion Protection	44
Inventions and Patents By Arthur H. Seidel			51
Composition and Application By D. J. Fishlock	n of	Anodes	55
How to Specify a Painted Fi	inish		60
Improved Fluorescent Paint	s Exp	and Their Engineering Uses	62
Spray Booths and Oven on S Quality Problems By Ira Findley	tilts	Solve Space and	64
Specific Gravity of Sulfuric Solutions By J. B. Mohler	Acid	— Aluminum Sulfate	66
Science for Electroplaters -	— Par	t XLV	67
DEPARTMENTS			
Shop Problems Patents Abstracts	70 72 75	Business Items News from California Associations and Societies	89 99 101

Published Monthly By Metals and Plastics Publications, Inc. Established in 1903 as Metal Industry by Palmer H. Langdon 1868-1935. 381 Broadway, Westwood, N. J. NOrth 4-1530

76

Obituary

Joan Trumbour Wiarda, President and Advertising Director; Palmer H. Langdon, Publisher; John E. Trumbour, Business Manager; Nathaniel Hall, Technical Editor; Daniel A. Marino, Ass't. Tech. Editor; Fred A. Herr, Pacific Coast Editor; Inez Oquendo, Equipment & News Editor; Elizabeth Meyers, Circulation Manager; John Ashcraft, European Representative.

BRANCH OFFICES

Los Angeles 14, Calif. 219 West 7th St. MAdison 6-5421

Recent Developments

Chicago 1 35 East Wacker Drive Financial 6-1865

Manufacturers' Literature

SUBSCRIPTION INFORMATION

United States and Canada \$5.00 per year, other countries \$10.00. Single copies 65c in United States and Canada, other countries 85c. GUIDEBOOK-DIRECTORY 27th edition 1959 current, 764 pages 5½x7½, subscriber's edition \$2.00 per copy. Please remit by check or money order; cash should be registered. Request for change of address should reach us on or before the 15th of the month precading the issue with which it is to go in effect. In sending us your change of address, please be sure to send your old address cay well as the new one. It is difficult and often impossible to supply back numbers. Copyright 1959 by Metals and Plastics Publication, Inc. All rights reserved. Contributed articles, letters or pertinent subjects are invited. Their publication, however, does not necessarily imply editorial endorsement. Re-entered as second class matter June 13. 1940 at the post office at New York, N. Y. under the Act of March 3, 1879.



Member





OROSENE* 999 24K ACID BRIGHT GOLD

OROSENE

999 is an entirely new gold complex. It produces mirror bright, hard electroplates in either rack or barrel plating.

999 produces a bright, hard 24 Karat (99.8%) gold place. It is the ONLY 24 Karat bright gold.

OROSENE

999 24 Karat Gold electroplates are twice as hard as ordinary 24 Karat gold plates—this is produced by a preferred orientation of the gold micro crystals. It is as hard as ordinary bright alloy golds. (125 Knoop).

OROSENE

999 24 Karat plates are ductile; as ductile as ordinary 24 Karat plates. This is achieved by the preferred orientation of crystal lattice.

OROSENE

999 contains NO silver; NO sulfur compounds and NO antimony. It has exceptional tarnish and sulfide resistance.

OROSENE
999 barrel solutions have the best throwing power
and leveling of ANY bright gold or ordinary gold for barrel plating.

999 bright gold has only ONE addition agent It is self-regulating and simple to control.

OROSENE

999 24 Karat Hard Bright Gold offers the electroplating metallurgist a new dimension in gold plating. It solves many plating problems where ordinary bright, hard or 24 Karat golds have failed.

Tr Palent Pending echni 39 Snow Street Providence, R. I. JAckson 1-4200



Chicago Office 7001 North Clark Street



News about COATINGS FOR METALS

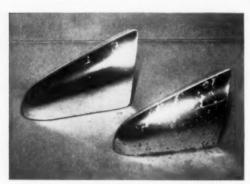
from Metal & Thermit Corporation

How to match chromium plate to service requirements

No longer is all chromium plate alike physically despite the fact that it remains the same *chemically*.

FOR MORE CORROSION RESISTANT BRIGHTWORK

The newest type of bright chromium plate offers much greater corrosion resistance than previously obtainable. It is free from the microscopic cracks inherent in ordinary chromium deposits and thereby prevents corrosives from contacting the underlying metal. For this reason, Unichrome Bright Crack-Free Chromium makes a major improvement in the corrosion resistance of decorative brightwork. It assures more uniform plate distribution and ample thicknesses in recesses. And with freedom from the cracks characteristic of ordinary chromium, Bright Crack-Free Chromium actually reinforces the resistance of the copper and nickel undercoats normally used.



Bright Crack-Free Chromium promises to put an end to pitted and rusted auto brightwork. It plates without cracking, and eliminates pores by producing thicker bright deposits free from cracks. (Compared with ordinary chromium after 72-hour acetic acid salt spray test.)

TO OVERCOME CORROSION, WEAR, HEAT

Another new type of plate, Unichrome Industrial Crack-Free Chromium, delivers greatly improved corrosion, wear, and heat resistance for industrial or engineering-type applications. A ductile matte deposit free from corrosion-admitting cracks, it has excellent resistance to impact, abrasion, and thermal shock. Hardness ranges from 500 to 700 Knoop.

These properties of Unichrome Industrial Crack-Free Chromium are used to protect rocket engine assemblies subjected to hot, erosive, corrosive combustion gases. They also solve corrosion and wear problems on parts such as hydraulic rams, power steering shafts, high temperature molds, and washing machine shafts.



Resistance to thermal shock and superior corrosion resistance suit Unichrome Industrial Crack-Free Chromium for such uses as plating of rocket engine combustion chambers.

FOR OTHER APPLICATIONS

A third process, Unichrome SRHS® Chromium, has proved uniquely successful in applications where freedom from cracks is not required. It plates up to 80% faster than the ordinary chromium process, deposits chromium with less dulling and burning due to its unusually wide bright plate range. Its unique production advantages lead to an engineering benefit: more uniform control of plating quality.

NOTE: SRHS Chromium excels for plating stainless steel, enabling platers to "color-match" all brightwork on a product.

Send for bulletins giving more details. Write Metal & Thermit Corp., Rahway, N. J.

METAL & THERMIT

Metal Finishing

POLISHING AND BUFFING . BARREL FINISHING . CLEANING PLATING . ANODIZING . RUST PROOFING . LACQUERING & ENAMELING

ESTABLISHED 1903

VOLUME 57

NUMBER 3

MARCH, 1959

A GOLDEN ANNIVERSARY

I shall pass through this world but once. If, therefore, there be any kindness I can show, or any good I can do, let me do it now; let me not defer it or neglect it, for I shall not pass this way again.

Fifty years ago, this month, the first Roosevelt had just turned over the reins to William Howard Taft, three states had not yet joined the union, and we counted a population of about 90 million. A foreman plater earned about \$27.50 per week, which was not a poor wage according to the standards of those days, but he had very little to guide him.

On March 6, fifty years ago, two dozen of them met in New York City, at the old Hotel Chelsea, to discuss the creation of a non-profit association for the advancement of electroplating, metal finishing and allied arts, and the American Electroplaters' Society was born. As a result of this meeting and another two weeks later, attended by additional recruits, the National Electro-Platers Association of the United States and Canada (NEPA) was formally organized on April 10 with sixty charter members. As their first president they chose Charles H. Proctor, the forward-looking New Jersey plating and foundry supervisor who inspired that first meeting.

Growth was rapid, with 144 active members in 1912 and over 350 in 1913 and, on June 1, 1913, when NEPA was reorganized as the American Electroplaters' Society, it boasted 13 chartered branches spanning New York to St. Louis from east to west, up to Toronto, Canada, and had already been host to the industry's first Industrial Finishing Exposition. At this first annual meeting as a national society George B. Hogaboom was inducted as president of the AES, and yearly dues were set at \$5 per member. Membership consisted of three classes: Active Members who were required to be platers or chemists, Associate Members who were connected with suppliers, and Honorary Members. Individually and as a group they pioneered the development of metal finishing along scientific lines so that we, today, can enjoy the benefits of their efforts.

From these beginnings the AES has matured into a world-wide technical organization, with 58 autonomous branches and almost 8,000 men and women who pride themselves on their membership. Mere survival for five decades would have been noteworthy in itself, and the phenomenal growth registered by the Society is incontrovertible evidence that the precepts of the founders have been followed faithfully. Advancement of the art and dissemination of knowledge will always be the guiding principles of the AES. May we say "Happy Birthday" and offer our congratulations and best wishes for the future!

Nathaniel Hall

Copper-Nickel-Chromium and Corrosion Protection

By A. H. Du Rose and W. J. Pierce, The Harshaw Chemical Co., Cleveland, Ohio

S EVERAL years ago a paper¹ by one of the authors pointed out that, in his opinion, one of the greatest problems in the plating field, is poor reproducibility. It was stressed that, from the standpoint of corrosion protection, while an individual exposure test might show good precision within itself, generalized conclusions, could not be made from the results. This has become quite evident in recent years from various published results regarding copper-nickel-chromium deposits and their servicability in various locations. It is for this reason that the authors, while arriving at certain conclusions in this paper, hesitate to say that these conclusions are invariably true under all conditions.

Some of the questions which are receiving considerable attention at the present time are:

- Are plated parts, especially on cars, giving as good corrosion protection as was obtained in the past?
- 2. Are results obtained at one outdoor exposure site representative of those obtained at other sites?
- Do accelerated corrosion test results predict serviceability?
- 4. Is a copper undercoat prior to nickel of any value?
- 5. Does bright nickel have as good corrosion protective value as gray nickel?

From numerous corrosion tests — accelerated, roof and service — involving many thousands of plated panels over the years, we have arrived at certain general conclusions. The word 'general' is used because, for practically all cases, exceptions can be found in our own results or published results. The cause of these exceptions can be conjectured in some cases but, in many cases, is completely baffling.

Stated briefly, our conclusions in regard to the previous questions are:

- Discounting extreme recesses and taking into consideration a supposedly more corrosive atmosphere, plated parts are as good now as they were in 1938.
- Between two different types of outdoor exposure sites the order of merit of different coppernickel-chromium coatings is usually the same, with some occasional unexplainable reversals. It is not unusual, however, for two coatings to be different at one site and practically the same at another site.

- Similar differences in order of merit are obtained between outdoor exposure sites and accelerated corrosion tests as are obtained between different outdoor exposure sites.
- 4. A copper undercoat prior to grey nickel or a sulfur-free nickel deposit is of practically no benefit. A copper undercoat prior to a sulfurcontaining nickel is frequently beneficial. The improvement may be equal to that of an equal thickness of additional sulfur-containing nickel. When corrosion does occur, the copper-nickelchromium plated article will be more unsightly due to crater-rusting than would be the case for nickel-chromium.
- Sulfur-containing semibright or bright nickel deposits do not exhibit as good corrosion protection as do sulfur-free deposits.

The question whether plated ware was better in the past can be more easily answered if we define what we mean by the past. If we refer to a time prior to about 1935, the question of grey nickel versus the organic type bright nickel can legitimately be involved. If we refer to the period shortly after 1935, when bright nickel was widely used tit is difficult to understand how the organic type bright nickel can be blamed for the present poor serviceability.

It is questionable whether any factual proof is available to show that nickel plating is not as good today as it was 20 years ago. However, the recollection of most people is that this is the case and, while the use of the organic type bright nickel might be some small factor, the authors believe that two other often overlooked factors are of much more importance. One of these is the more corrosive atmosphere in most urban areas, and the other is the more complicated parts which are plated today.

Exceptions can be cited no doubt, but there is hardly any question that our atmosphere today must be more corrosive than in past years, due to the large increase in the number of cars on the road and the rapid increase in the use of household incinerators. Industry may have contributed to this to some small extent, but, due to anti-pollution campaigns, this cause of corrosivity is probably relatively minor. The change in the Pittsburgh atmosphere during the past 12 years is a notable example. However, most air pollution data² will show an increase in constituents which can cause corrosion of nickel and chromium. Even without analytical data the increase in vehicle registrations from about 28 million in 1937 to about 67 million in 1957 should be convincing.

Any plater or car owner will vouch for the increase in complexity of plated parts over the past years. To some extent this has added to the beauty of the automobile but, certainly, not to the "lasting beauty." Admittedly, the public likes streamlining and an abundance of bright shiny "chrome" on its cars, but does this mean they like bumpers, hood ornaments and headlamp frames with extreme contours? To some extent the increase in complexity has forced the advance of the art and science of plating, but there is a point beyond which the cost is substantially increased.

Evaluation of Corrosion

The method of evaluating corrosion and arriving at numbers which will show the relative value of coatings is somewhat confusing and, for several years, has been in a state of flux. This makes it difficult sometimes to compare results obtained at two different times or by different examiners. For this reason we have adopted the policy of drawing tentative conclusions from one test on panels or parts. If these same conclusions are found valid from several additional tests, then these conclusions are regarded with more certainty. We do not try to correlate detailed numerical data from one test with another test which was conducted at a different time or place. This is true as much for atmospheric exposure as for accelerated testing. The rate of deterioration outdoors depends greatly on the season. It is not unusual for "fairly good" deposits to be badly broken down after 4 or 5 months on our roof during the winter. (This would indicate that frequent washing of a car, and the use of wax or oil during winter months, is highly advisable even for fair quality plating.) During the eight milder months of roof exposure, deterioration is almost negli-

Because of variability in plating, testing, and evaluating, it has seemed advisable to plate and test small sets of panels at different times with overlapping variables, rather than to attempt to draw conclusions from one large set of panels. When the latter is done it is very disappointing to find frequently that the conclusions are not verified by a similar test. By running a large number of smaller scale experiments, one at least may draw certain conclusions which are true most of the time: but it must be recognized that there may be exceptions and that the reason for these exceptions, in many cases, is unknown. The authors are not embarrassed to admit this inconsistency of results. It is known with certainty that the same inconsistency occurs with others who run a large number of corrosion tests.

As mentioned previously, one of the confusing factors has been the inconsistent methods of rating and reporting exposure results. This involves such questions as the relative importance of various defects; how long should an accelerated test or a roof exposure be, in order to arrive at significant differences and conclusions; should the panels be washed periodically during outdoor exposure; should they be washed prior to rating; should panels be slightly bent prior to exposure; should defects on the edges be discounted; etc.

Several methods have been used in this country for arriving at rating numbers, and we have used all of these at times, and they all have certain advantages. It is probably safe to say, however, that with any of these methods we have tried to take into consideration relative commercial merit. When we think of relative merit between several panels or sets of panels we are thinking of which coating we would rather have on our car. The reason for this is that there is occasional disagreement between inspectors regarding rating numbers applied to different panels. However, when the question is asked, which deposit they would rather have on their car, the disagreement, in most cases, evaporates.

Another factor of which we have been only too well aware, is the variability in degree of deterioration between so-called replicate panels or parts. For this reason, along with average ratings (say of 4 panels). we consider either mathematically or "mentally" how significantly different this average rating is from the average of other panels. This frequently avoids making unwarranted conclusions and, in many cases, can explain apparent "reversals" of results between two tests or exposure sites. In most cases, in the tables presented, these two factors have been considered; i.e., the rating numbers represent an order of real merit, and "rounded off" confidence limits are given. Where confidence limits are given for averages, they have been calculated from the mean range and are the so-called 95% limits. This necessitated the assumption that the variance was the same for all sets of panels at one exposure site.

It will be noticed in some of the tables that the results contradict some of the general conclusions which have been made. In some cases this was done for the purpose of showing "normal inconsistency." The conclusions, of course, are based on many such tests.

It will also be noticed that similar coatings under similar tests frequently have significantly different rating numbers. The reasons may be known or unknown but it emphasizes the reason why we try to correlate conclusions from one test to another, but not actual data.

Two kinds of rating numbers are used in the tables: the ASTM number which is based on the so-called "Section D"3 method but modified by Chrysler Corporation: and the General Motors Performance Index.5

The ASTM number takes into consideration the importance of various defects by means of weighting factors. A rating number of 10 means that the weighted per cent defective area is less than 0.05%. A rating number of 1 represents about 50% defective area. There is a logarithmic relation between the number and the per cent area defective.

The Performance Index (P.I.) is a valuable tool for rating salt spray, acetic acid salt spray, and accelerated acetic acid salt spray⁶ results since it takes into consideration the rate of deterioration as well as the extent.

Corrosion Results

Tables 1 through V give results comparing methods

of corrosion testing on various decorative coatings.

From Table I it might be concluded that there is fair correlation between the three exposure sites and the Corrodkote test, for both plated steel and die-cast basis metals. It is also apparent that there is little difference between the various bright nickel deposits, and that the sulfur-free semi-bright and duplex coatings are better than the bright nickel. Particularly in the case of steel, however, we could not be certain of this. For instance, the confidence limits leave some uncertainty regarding the difference between P, D and F at Detroit.

The data in Table II suggest that: Watts nickel is better than bright nickel; the difference between bright nickel and Watts nickel is greater at seacoast sites than at the industrial sites; at least at New York the copper undercoat prior to bright nickel is not as good as an equal thickness of nickel. Note that, for this set of data, exceptions can be found to any of these conclusions and, by comparing lot 5 with lot 1 at New York, a contradiction can be found to our previous general conclusion that copper is not too harmful under bright nickel. It should be noted that the ASTM, B-8, Program 1 showed quite definitely that copper was of no benefit under grey nickel.

Table III demonstrates the effect of increasing bright nickel and chromium thicknesses. The chromium bath was "standard" and, as would be expected, the heavy chromium deposits crazed badly and on the thin nickel caused cracking to the basis metal. This table demonstrates good correlation between Cleveland exposure and the Corrodkote test. It also demonstrates the usual and expected effects of increasing nickel and chromium thicknesses.

With some exceptions, Table IV shows fair correlation between Florida, Cleveland, and Corrodkote results. For Corrodkote, the differences between nickel deposits are less than those shown by the outdoor results. Here, again, it is evident that the sulfur-free de-

TABLE I
Relative Protective Value of Nickel Deposits at Various Exposure Sites

No.				Cr Mils		ASTM Rating Numbersa		
	Basis Metal	Cu Mils	Ni Mils		Florida 1 Yr.	Detroit 1 Yr.	Pitts- burgh 1 Yr.	Corrod- kote 1 Cycli
1	Zinc	0.3	0.9N	0.01	5.3	7.2	8.4	7.4
2	**	0.3	0.9M	0.01	5.0	7.3	7.5	7.3
3	**	0.3	0.9P	0.01	5.4	7.2	7.6	7.5
4	49	0.3	0.9D	0.01	7.2	10.0	10.0	8.7
5	**	0.3	0.5N	0.01	5.2	5.9	7.6	7.0
Confidence								
Limits (±)a					0.5	0.5	0.5	0.5
1	Steel		1.5N	0.01	5.4	8.2	8.6	6.0
2	99		1.5M	0.01	4.9	8.4	8.0	6.5
3	**		1.5P	0.01	5.5	9.0	8.8	8.2
4	99		1.5D	0.01	9.0	10.0	10.0	9.6
5	99		1.5F	0.01	10.0	9.4	10.0	8.4
6	**		1.0N	0.01	4.9	7.2	8.6	5.6
7	**	*****	0.8D	0.01	5.9	9.3	9.6	7.6
Confidence								
Limits (±)a					0.5	1.5	1.5	1.0
N. M and P	Sulfur-containing bright	nickel depo	sits.					
F	Sulfur-free semibright d	eposit.						
Ð	Duplex deposits of F fol							
a	Based on average of rati	ngs of 4 pan	els.					

TABLE II

Exposure Results (Unofficial) on ASTM Panels*

	Cyanide		*** * *		ASTM Rating — (After Cleaning)			
Lot Vo.	(Mil)	(Mil)	Nickel (Mil)	Total (Mil)	Kure Beach	New York	Detroi	
1	0.0	0.0	1.5B	1.5	3	8	8	
2	0.2	0.8	0.5B	1.5	3	6	8	
3	0.05	0.95	0.5B	1.5	2	5	7	
5	0.2	0.3	1.0B	1.5	3	5	8	
6	0.05	0.45	1.0W	1.5	7	8	9	
7	0.1	0.0	1.4W	1.5	9	8	9	

a ASTM, B-8, Sub II, Program No. 3

B Bright Nickel

W Watts Nickel

TABLE III
Exposure Results on Bright Nickel and "Standard Chromium" on Steel

w	ils	Cleveland	ASTM Rati	ng Numbersa		
Ni	Cr Cr	9 Mo.	7 Hes.	Corrodkote ^b 14 Hrs.	29 Hrs.	Principal Defect
0.3	0.003	3.4	5.7	3.8	3.1	Rust
0.3	0.01	4.9	7.0	6.7	6.7	Rust
0.3	0.03	3.0	6.3	4.6	4.3	Rust and Crazing
8.0	0.003	4.0	6.5	4.2	3.8	Rust
0.8 8.0	0.01	5.1	7.8	7.2	6.8	Rust
0.8	0.03	6.6	10.0	8.1	6.6	Crazing
1.5	0.003	4.7	7.0	6.7	4.5	Rust
1.5	0.01	6.1	8.8	7.6	7.4	Rust
1.5	0,03	6.7	10.0	10.0	9.2	Crazing
Confidence						0
Limits		0.5			0.5	

a - Average of 4 panels for Cleveland and 2 for Corrodkote.

b - The hours given are for the "non-condensing" half cycle. This was followed by the usual "condensing" half cycle.

c - Fall, Winter and Spring.

TABLE IV
Exposure Results of Various Nickel Deposits
(Nickel 1.0 mil, Chromium 0.01 mil; on Steel)

W N	Florida	Cleveland	Corrodkote	
Type Nickel	12 Me.	4 Mo. (Winter)	4	B
N; Sulfur-containing bright	1.5	4.0	6.1	6.1
R: Sulfur-containing bright	2.6	5.4	6.1	6.2
S; Sulfur-containing semibright	6.0	3.6	6.6	5.8
F; Sulfur-free semibright	8.0	6.0	7.2	7.1
D-1; S + R	1.4	5.0	6.1	6.1
D-2; F + N	8.8	6.0	7.5	7.4
Confidence Limits	1.0	0.4	0.4	0.4

TABLE V

Accelerated Corrosion Tests on Various Nickel Deposits
(Average of 8 Panels)

Basis Metal	ϵ_u	Mila Ni	ϵ_r	Corrodkote ASTM No.	Acetic Acida Salt Spray P. I.	Accelerated Acetic Acid Salt Spray P. 1.
Steel		1.3bF	0.01	8.0	95	30
Steel		1.3 P	0.01	8.3	97	53
Steel		0.6 P	0.01	8.0	86	46
Steel		1.3 D	0.01	10.0	96	82
Zinc	0.4	0.8 F	0.01	7.9	87	30
Zinc	0.4	0.8 P	0.01	9.8	92	50
Zinc	0.4	0.8 D	0.01	10.0	94	83
Confidence Limits				0.5	4.0	8.0
 a — 96 hours. b — See Table I for types of nickel. 						

posits are more protective than the sulfur-containing bright nickel deposits. Deposit S (from a solution containing a naphthalene sulfonate) seemed to perform much better at the Florida seacoast than at the industrial Cleveland site. However, the situation was reversed when it was used as the undercoat in a duplex deposit.

When the confidence limits are considered, Table V demonstrates reasonable correlation between the two acetic acid salt spray tests and Corrodkote. There is not much doubt that the duplex deposit performs better

than bright nickel here but, for some unknown reason, the semibright deposit in this case seems to perform worse than the bright nickel. This happens occasionally also with grey nickel and it has been said, "we have forgotten how to plate good grey nickel."

Ratings of 10 (ASTM) as in this table and others should not be construed as meaning absolutely no corrosion defect. A rating of 10 could be applied to a panel having 0.05% defective area, but this also depends somewhat on the examiners interpretation of "defect" and "defective area."

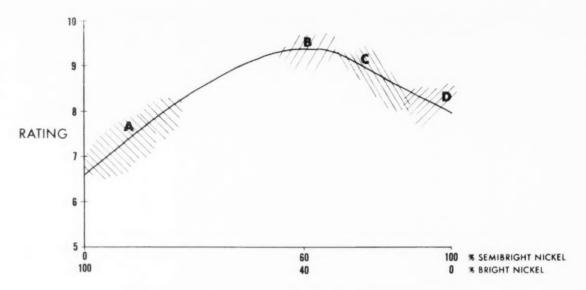


FIG. 1 - TYPICAL CORRODKOTE RESULTS ON BRIGHT, SULFUR-FREE SEMIBRIGHT AND DUPLEX NICKEL DEPOSITS. NICKEL 1.3 mil. CHROMIUM 0.01 mil.

Discussion of Results on Nickel Deposits

While we believe and have said there is fair correlation between different exposure sites and corrosion tests for copper-nickel-chromium, we have tried to emphasize that exceptions can be found. However, it is not always certain that these exceptions are real; they might be due to factors other than the different exposure tests. From an overall standpoint then it might be better said that there is correlation but it is not always good correlation. One test does not suffice to prove this.

However, it is almost always true that, if there are large differences between two types of coatings at one site, the differences will be in the same direction at another site.

The duplex deposit shown in the tables, having a thin sulfur-containing bright nickel coating over a heavier sulfur-free semibright coating, usually gives an ASTM rating about 2 units higher than obtained for the same thickness of sulfur-containing bright nickel. It should be noted that, if this difference of 2 represents ratings of 7 versus 9 or about 30% improvement, the difference in per cent defective area is 0.1 versus 0.05% or about 400% improvement.

By most methods of rating this type of duplex coating performs better than all bright nickel or all semibright nickel. A typical curve showing the Corrodkote rating and type of principal defects for various ratios of semibright and bright nickels in the duplex coating is shown in Fig. 1.

The principal defect at Area A and D is pinhole rusting. At Area C there is very little rust but considerable surface pitting through the bright nickel, stopping at the sulfur-free semi-bright deposit. At Area B there is, in most cases, less surface pitting than at Area C, so that the weighted rating number is higher than at C. For outdoor exposure there is very little difference

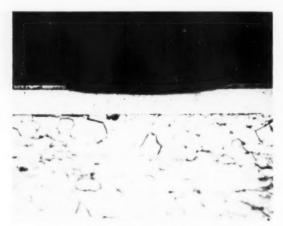


Fig. 2. Surface pitting of sulfur-free semi-bright and bright nickel duplex deposit on steel.



Fig. 3. Illustration of pinhole corrosion of a bright nickel deposit on steel.

in merit between coatings represented by Areas B and C.

The type of surface pitting encountered at C and the type of pinhole rusting at A (100% bright nickel) are shown in Figures 2 and 3. These photomicrographs of defect cross sections taken at 500X, show that, in the case of the sulfur-free semibright-bright duplex coating, corrosion is slowed down after penetration of the bright deposit. Fig. 4 shows the corrosion results when a sulfur-containing semibright nickel is used as an undercoat prior to bright nickel as in D-1 of Table IV. In this case, corrosion penetration of the bright nickel will result in failure of the sulfur-containing undercoat. Figures 5 and 6 show similar corrosion results when bright nickel and duplex coatings are applied to copper plated zinc-base die-castings. In Fig. 5, corrosion of the bright nickel and copper has resulted in basis metal corrosion and deposit blistering. In Fig. 6, it is again shown that corrosion is slowed at the interface between the bright nickel and the sulfur-free semibright undercoat.

The surface pitting mentioned in connection with Fig. 1 is mostly characteristic of the Corrodkote test. It occurs much less in the acetic acid salt spray tests or outdoors. It has been observed on a smaller scale on panels exposed to very corrosive outdoor atmospheres. It is practically undiscernable in service. Surface pitting can be greatly reduced by use of a heavier-than-normal, crack-free chromium deposit.

In addition to surface pitting, as with any chromium plated nickel deposit, other surface defects such as various forms of "crow's feet" are observed after outdoor or accelerated testing. The shape of these surface defects seems to be interdependent on the nature of the nickel, the chromium, and the exposure.

It is possible that some mild galvanic protection is involved which explains the improved protection provided by a sulfur-free nickel followed by bright nickel. For instance, if corrosion of the more anodic bright nickel takes place in minute spots over the surface, this could account for the lack of penetration of the less active sulfur-free deposit. It is well known that sulfur-containing nickel will dissolve faster chemically or anodically in various media than will grey nickel. While Edwards' data8 show no faster corrosion rate for sulfur-containing bright nickel than for sulfurfree deposits on outdoor exposure, our tests do show this expected tendency. More outstanding is the higher pinhole perforation rate, either outdoors or in accelerated corrosion tests, for bright nickel if not too thick. In etching cross-sections of duplex deposits to reveal nickel structure, it is sometimes difficult to bring out the structure of the sulfur-free deposit without over-etching the bright nickel. Another type of galvanic protection is frequently observed on duplex deposits. When corrosion does occur in the form of a pinhole to the basis metal, there is a lower than normal frequency of surface pits surrounding the pinhole.

The Chromium Deposit

While the type of nickel and its thickness is known to have a marked effect on corrosion protection, it has only been within the last 4 or 5 years that the importance of the chromium coating has become widely

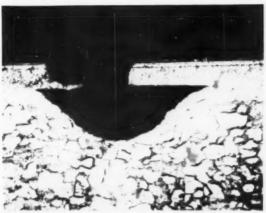


Fig. 4. Pinhole corrosion of a sulfur-containing semi-bright and bright nickel duplex deposit on steel.

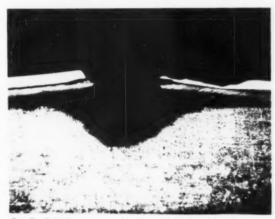


Fig. 5. Pinhole corrosion of copper and bright nickel deposit on zinc diecast.





Fig. 6. Surface pitting of sulfur-free semi-bright and bright nickel duplex deposit on copper plated zinc diecast.

recognized. The 0.01 mil deposit of chromium was considered a compromise between a thin, but less protective coating, and a heavier coating which would become unsightly because of crazing or cracking.

Surprisingly, the crazing of heavy "normal" chromium was found to be just as bad on buffed, dull or semibright deposits and on duplex deposits as it was on the more brittle bright nickel. Gradually it became

TABLE VI

Corrodkote Results on Commercially Plated Zinc Die-Castings
(Copper 0.4 mil, Nickel 0.7 mil; Average of 3 Parts)

Type of Nickel	Temp. of Chromium Solution	Thickness of Chromium (Mils)	ASTM Rating No.	Principal Defect
Bright	112°	0.01	7.6	Small craters
Bright	130°	0.015	8.5	Small craters
Duplex	112°	0.01	8.8	Surface pits
Duplex	130°	0.015	9.5	Surface pits
Confidence Limits			0.8	

recognized that if the chromium bath was operated at higher temperature, the deposit would have less tendency to craze. This gained wide spread attention by the publication of H. Brown et al.,⁹ in which both the temperature and chromic acid-sulfate ratio were shown to be important.

Most of our work with the high temperature bath (130-150°F) was done with the normal "ratio." Outdoor exposure results almost always showed a marked benefit by using a higher-than-normal thickness of "high temperature chromium." More recent work using accelerated corrosion testing has shown the same tendency and also shown a similar advantage by using a proprietary crack-free chromium deposit. One advantage of the latter is that the deposit is less blue than that plated from a standard bath at 130°F or higher.

Our general conclusion on chromium is that a distinct advantage in corrosion protection can be obtained by using a high temperature chromium solution or the "crack-free" variety, but that a heavier than normal thickness should be used. There is very little advantage in using only the normal 0.01 mil thickness. An obvious advantage of the heavy deposit is that the thickness in the low current density is more likely to meet the 0.01 mil requirement.

Table VI and VII give Corrodkote results showing the effect of type and thickness of chromium. A distinct advantage is shown by the heavy, "high temperature chromium."

It will be noticed that, when the "high temperature chromium" is color-wiped, a marked deterioration in protective value takes place. This harmful effect can be offset substantially by reimmersion in the chromium bath and rinsing. Lightly wiping with magnesia, as is frequently done prior to corrosion testing, does not seem to have the same harmful effect as "color-wiping."

While not shown in the tables, some additional gain in corrosion protection can be obtained by using a double layer of chromium. This can be accomplished by interrupting the current or using a chromium platerinse-chromium plate cycle. However, it is not always feasible to do so in production because of mechanical problems, or because of the type of chromium solution used.

As shown in Table VII, it was necessary to use two Cororodkote cycles in order to show the advantage of heavy, high temperature chromium over the duplex deposits.

In using the high temperature chromium bath, a (Continued on page 54)

TABLE VII

Corrodkote Results as Affected by Type of Nickel and Chromium

(1.25 mil Nickel on Steel; Average of 4 Panels)

	_				
No.	Type of Nickel	Temp. of Cr Bath	Mils Chromium	Rating (± 0.6)	Principle Defect
1	Bright	115°	0.01	8.4	Pinhole rusting
2	,,,	115°	0.03	9.5	Crazing
2A	99	115°	0.03	9.5	Crazing
3	**	135°	0.01	8.2	Pinhole rusting
4		135°	0.03	9.8	
4A	99	135°	0.03	7.6	Pinhole rusting
4B	**	135°	0.03	9.8	
5	**	150°	0.01	8.2	Pinhole rusting
6	**	150°	0.03	9.8	
6A	**	150°	0.03	8.7	Pinhole rusting
7	Duplex ^a	115°	0.01	9.0°	Surface pitting
8	99	115°	0.03	9.0	Crazing
9	***	135°	0.01	9.0	Surface pitting
0	**	135°	0.03	9.9	Surface pitting
1	**	150°	0.01	9.2	Surface pitting
2	79	150°	0.03	10.0	

A - Chromium was color wiped.

B — Chromium surface wiped with magnesia.

a — Duplex deposits were practically perfect after one Corrodkote cycle and the values given are for two cycles.

Inventions and Patents

By Arthur H. Seidel, Patent Attorney, Philadelphia, Pa.

THE subject of inventions and patents as it relates to the electroplating and related industries is substantially similar to the application of this body of law to inventions in general. Thus, the electroplating industries run the whole gamut encompassed within the patent law. Our patent statutes define patentable inventions as being "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof."

The finishing industries manifestly encompass all of the four statutory classes of invention, namely processes, such as the electrolytic processes which are the bread and butter of the industry; machines, of the wide variety associated with the industry such as mechanical polishing equipment; manufactures, which may be distinguished from machines in terms of the patent law because of their lack of moving parts, and which include a great variety of trays and racks for holding parts during electrolytic processing; and compositions of matter, which in this industry includes literally a plethora of plating, cleaning, polishing, and like baths. Because of the broad expanse of the electroplating industry, it would appear advisable, therefore, to treat the patent system as whole.

Our patent system finds its origin in the Constitution and, among the very first statutes passed by the first United States Congress, was the Patent Act of 1790. This means that we have a single patent system in the United States, and not a system which varies from state to state. Furthermore, as a corollary, we have a single Patent Office empowered to grant patents. Moreover, all patent lawsuits directly involving the validity and infringement of patents are tried in the federal courts.

What Is An Invention?

The statutory definition of patentable inventions has been set forth above. It is to be noted that the four stated classes enumerate the only inventions for which patent protection is possible. While the classes have been broadly defined, so that patents are granted on many inventions which do not seem to squarely fall within the four classes, such as buildings; yet, some of the most common inventions are not patentable because they fall outside of the four statutory classes. Any invention which is dependent for its success upon mental processes, such as methods of keeping books, doing business, etc. is not patentable, nor may the discoverer of a law of nature patent his invention. This means that the inventor of an ash tray may obtain patent protection for his invention, but that Einstein would have been denied patent protection had he sought the same for his fundamental equation relating energy, mass, and the velocity of light. That

he didn't is a fact in no way attributable to his early years when he worked as a patent examiner.

In addition to the quoted four classes of invention, it is to be noted that two further conditions precedent are included within the definition of patentable inventions, namely that the same be "new and useful." The requirement as to utility is normally not a serious obstacle, as the Patent Office has leaned over backwards in connection with this requirement. Otherwise, the pioneering inventions in the field of electronics, such as radio tubes, could never have been patented since their utility was decidedly limited at the time of their invention. However, the requirement for utility occasionally proves to be a stumbling block in connection with chemical inventions, as when a new chemical compound is synthesized, and there is no known use for it.

However, the great road block to the obtention of patent protection is normally the requirement set forth in the statute of novelty. Thus, under our law, no patent can be granted unless an invention is "new" and, in another portion of our patent statutes, this requirement is amplified further by the statement that a patent may not be obtained if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."

The Patent Search

How can an inventor who has made an invention determine whether the same is new, and patentable within the test set forth in the patent statutes? The simplest approach to this problem is to have patent counsel effect a patentability search for the invention. In the search room of the Patent Office in the Department of Commerce Building in Washington, D. C. there is assembled a complete collection of United States patents classified according to subject matter. It is to be noted that, while a number of libraries and academic institutions in the United States have complete numerical collections of the United States patents (of which there are more than 2,850,000), the only complete classified collection in which subject matter searches can be made is in Washington. There. the vast body of patents is classified into more than 300 major classes and more than 50,000 search sub-

While the patentability search through the appropriate search sub-classes is the most common type of search, it is by no means the only form of search which is conducted in the search room of the Patent Office. Other types of searches include the infringement search, which has as its purpose to determine

whether the manufacturer of a given item would infringe any unexpired United States patents; the state of the art search, a broad type of search whose purpose is to familiarize the person seeking information about a specific field with what has been done in such field: and the validity search, which is really a glorified patentability search, and which has as its purpose an inquiry as to whether a specific patent is valid and would stand up in litigation against a defense of non-inventiveness.

It is the author's opinion that wider use should be made of the state of the art type searches by industry. For example, if one is faced with a particular rack problem for supporting articles to be anodized, one of the best, cheapest, and fastest methods of acquiring know-how as to what has already been done in the field of racks would be to have a state of the art search performed in this field. Thus, patent counsel could pick up 50 or 75 patents disclosing different approaches to the particular problem, many of which patents would either give an insight as to suitable approaches for solving the problem, or would catalyze one's thinking in respect to the problem. Of course, all of the patents found more than 17 years old would be expired, and one would be perfectly free to use the inventions disclosed in such patents, since they have passed to the public domain.

Before leaving the subject of patent searches, a few words of warning are in order. If a land title search is properly performed, the searcher can be reasonably certain that he will have a complete picture in respect to a given parcel of property at the close of the search. This is not the case in respect to patent searching. The classification of inventions in many cases does not lend itself to a rote approach, so that patent searching is an art rather than a science. For example, if one were searching a composition comprising specified chemical components useful as a plating bath, it is conceivable that similar compositions which would bear on the patentability of the subject invention would be found in the field of chemical cleaning agents, in the field of non-electrolytic metal treating agents, etc. Accordingly, one who is searching such invention could never be certain that his search was complete. Thus, most patent searching represents a compromise between completeness and economic considerations. A corollary of the above is that one should not expect high grade patent searching at bargain rates.

The Patent Application

Assuming that a given invention is patentable, what is the procedure by which patent protection for it is obtained?

The first stage in the obtaining of patent protection for an invention is the preparation and filing of a patent application. This should represent a marriage between the inventor and his patent counsel. Thus, the inventor should first make as complete a disclosure of his invention as is possible to the patent counsel and, after the search results and the preparation of the initial draft of the patent application, the inventor should review the patent application with care to make certain that there is a complete disclosure of the invention including both the best working embodiment

known to the inventor and a disclosure of alternative embodiments, if the same are present, as well as a full development of the utility of the invention. Parenthetically, it should be noted that we have referred to the marriage of the inventor and the patent counsel. It should be emphasized that, under the United States patent law, only the actual inventor of an invention can file for patent thereon (with rare exceptions, as where the inventor is dead or mentally incapacitated). This means that if you see a nice item on your European trip which you know is not being manufactured in the United States, you cannot return to the United States and obtain valid United States patent protection for this item. It also means that business organizations, such as corporations, cannot file patent applications in their own name. A corporation may build up a patent position only by obtaining assignments from the inventors who file for patents, or by the patentees in the case where patents have already been issued.

Incidentally, a corporation or other business organization which employs technical personnel who may be expected to produce inventions during the course of their employment should have a written agreement with such personnel regarding the disposition of such inventions. In the absence of a written agreement the most an employer normally obtains is a shop right in the invention, which is a personal non-exclusive royalty-free license to practice the invention. All of the remaining rights would normally pass to the employee.

The parts of a typical patent application are as follows: The specification, the claims, the drawings, and the formal papers.

THE SPECIFICATION:

The specification comprises the descriptive part of the patent application. In this part of the application there should be as complete a treatment of the invention as possible, including the purposes which the invention is intended to satisfy, a complete working description of the best mode of operation of the invention, a discussion as to equivalents and alternative embodiments, and a description of the drawings and their mode of operation. The absolute necessity for a complete disclosure cannot be unduly emphasized. There is a most unfortunate tendency among many applicants, for chemical patents in particular, to attempt to conceal fundamental information relative to their invention by not including the same in their specification. These applicants would like to obtain the benefit of patent protection for their invention and yet be able to maintain their invention as a trade secret. This is simply not possible! The basic rationale for our patent system is that a patent is a contract between the United States and an inventor which the United States grants the inventor a 17-year monopoly in return for a disclosure by the inventor of an invention not theretofore known in the United States. Upon the failure of the inventor to adequately describe his invention, it is seen that there is a failure of consideration upon the part of the inventor. In practical terms, many a patent has been found to be invalid because the applicant failed to make an adequate disclosure of his invention.

THE CLAIMS:

At the rear of the specification appears the claim or claims of the patent. Patent claims are among the most difficult of legal instruments to draw and, normally, an inventor would be well advised not to unduly tamper with this portion of the patent application if he has retained competent patent counsel. The preparation of patent claims is, literally, a sea of quicksand for the unwary, and even the most common English words have peculiar meanings in claim terminology. For example, in the chemical patent law there is a vast difference between "comprise" and "consist" when the same are present in claims. If the claim states "comprises A, B, and C," then the claim would be infringed by a composition which included A, B, and C. and also other materials. However, if the claim calls for "consisting of A, B, and C," then such claim would be infringed by a composition which contained A, B, and C, but would not be infringed by a composition which contained additional materials to A. B, and C.

If the patent application is directed solely to a composition of matter, or to a chemical process, and hence to an invention not capable of satisfactory illustration by drawings (chemical formulas are not considered as drawings in this sense), then the patent application would not contain drawings. Otherwise, it would be accompanied by drawings. Patent drawings comprise a highly stylized method of illustrating materials. They are done in India ink on bristol board, and the form of drawings which are acceptable to the Patent Office is regulated down to minutiae. As a matter of fact, good patent draftsmen are a vanishing breed: not only must they be artists capable of illustrating complex mechanisms in perspective views but, moreover, their work requires great skill with the India ink pen including thick and thin lines. The obvious function of patent drawings is to graphically illustrate an invention, and this basic function should never be lost sight of. It is not necessary that patent drawings be done to scale, but rather they should be prepared so that the significant features of the invention being illustrated may be grasped by the viewer in the shortest possible time,

THE PETITION:

The formal papers which come at the end of the patent application are prescribed by law, and comprise a petition for patent, an oath as to inventor-ship, and an appointment of an attorney. It is to be emphasized that the filing of every patent application includes a sworn statement under oath that the applicant "verily believes" himself "to be the original, first, and sole inventor."

After the patent application is filed in the Patent Office (the government filing fee is \$30.00, plus an additional \$1.00 for each claim over 20) it receives a filing certificate on which appears its serial number and its filing date. For the remainder for the prosecution of the patent application, it will be referred to by this serial number.

Patent Pendency

The United States Patent Office is one of the most

unique bodies on the face of this earth. Its corps of professional patent examiners comprise men skilled in every branch of technology which can contribute patentable inventions, from the simplest of gadgetry to the most complex electronic mechanisms and chemistry. It is a tragedy of no mean proportions that the rapid advance of technology spurred by the recent wars and the continuing threat of future wars, and the low salaries paid to skilled technical personnel by the United States government have led to a situation in which there is a backlog of pending patent applications so great that the average pendency of a patent application before the United States Patent Office at the present time is between three and four years. As above-stated, most certainly the underpaid and overworked patent examining corps is not responsible for this delay. However, it is a fact of life which all inventors must learn to live with.

The routine followed during the patent pendency period generally runs about as follows:

Some months after the patent application is filed it receives its first Office Action from the Patent Office. Generally, in the first Office Action, some or all of the claims will be rejected for one reason or another, usually on the ground that they are not patentable over stated prior art. Occasionally, but relatively rarely, a patent application will be allowed on the first Office Action. When this is done, nothing more remains except for the payment of the final government fee, and the patent will issue.

In the normal situation where at least some of the claims are rejected, the attorney has six months in which to reply to the Office Action. The attorney may amend or cancel some or all of the rejected claims, or he may simply argue their patentability without amending or cancelling any of them.

Inventors who have not had prior experience with the patent system often become unduly concerned when they receive the first Office Action with its common rejection. However, this should not be a source of undue alarm, unless the examiner has cited exceptionally close prior art (as for example, prior art not located during the patentability search). While the policy as to first rejections varies almost from examiner to examiner, many examiners wish to have an argument inserted into the record as to why they allowed a particular patent application. Thus, the rejection contained in the first Office Action may have for its prime purpose only the eduction of an argument by the attorney as to why the subject invention constitutes a patentable advance.

After the submission by the attorney of a suitable response, and after a passage of time during which the application awaits its turn for further action, it receives a second Office Action from the Patent Office. This Office Action may reject some or all of the claims, or it may comprise a notice of allowance. The attorney will again have six months in which to file a suitable response. If issues of fact develop, the attorney may file supporting affidavits,

Ultimately an issue will be reached. Usually, this will come between the second and fourth Office Action. When the issue is reached, the examiner will allow all of the claims, or he may reject some of the

claims and allow the remainder, or he may finally reject all of the claims. The notification of the reaching of an issue will be by what is known as a final action. In the case of a rejection of some or all of the claims, the attorney may decide to interview the examiner, either personally or through his Washington associate. If an oral interview with the examiner cannot obtain the allowance of the claims sought to be allowed, the next procedure is to file an appeal with the Board of Appeals. This is a board made up of the highest examiners in the Patent Office, which sits as a three-man tribunal and passes on appeals from the examiner. If, after an appeal to the Board of Appeals, the allowance of some or all of the claims is still sought after, then the next appeal must be to the courts, either the Court of Customs and Patent Appeals, or to the United States District Court for the District of Columbia (technically not an appeal, but a trial having as its purpose the forcing of the Commissioner of Patents to grant a patent con-

taining the sought after claims). Occasionally, but often enough in a field undergoing rapid development to be a matter of grave concern, two or more different inventors will apply for a patent on the same or on substantially the same invention within a short period of time of each other. Under these circumstances, the Patent Office will institute what is known as an interference proceeding to determine which of the two inventors was actually the first inventor. This is a most complex type of proceeding and cannot be dealt with herein. However, it is to be emphasized that this type of proceeding generally depends on the written records of the opponents, as the party who has kept the best records in terms of supporting evidence will have the best chance for victory. Because of this, the absolute necessity for keeping good records in respect to the conception and reduction to practice of an invention cannot be overly emphasized.

The enjoining of an infringer of a patent is accomplished by a patent infringement suit in the federal courts. This may be costly to the plaintiff and defendant, but the successful upholding of a valuable patent may prove to have enormous commercial significance.

The sale of inventions and their licensing falls outside the scope of this brief paper, but a few comments are perhaps in order. A wide variety of means are available to accomplish the disposition of patented inventions. These include the outright sale of patent rights, technically known as an assignment. The sale may be limited to a particular geographical area, in which case the conveyance will be what is known as a territorial grant. Alternatively, a patented invention may be licensed on a royalty basis with a wide variety of schemes for determining royalty being available. Licenses can be broadly divided into exclusive licenses, where the license receives all of the rights defined in the license, and non-exclusive licenses, where the licensor is permitted to license a number of parties simultaneously, including competitors. Normally, in the case of an exclusive license, there should be a provision for minimum royalties.

It is possible to obtain capital gains treatment under certain circumstances both in the case of an assignment and of an exclusive license.

COPPER · NICKEL · CHROMIUM

(Continued from page 50)

higher current density should be used to offset the decrease in covering power and efficiency. In going from 115° to 130°F the current density has to be at least doubled to maintain the same efficiency.

Measurement of Chromium Thickness

The so-called spot test method for measuring chromium thickness has been used for many years and has the advantage of rapidity. However, in our work with various types and thicknesses of chromium, it became apparent that several factors, considered of minor importance by us and others, could seriously affect the thickness results obtained.

It is not uncommon to use the acid directly from a bottle of reagent C. P. grade hydrochloric acid. However, as is specifically mentioned by Blum and Olsen 10 and ASTM, 11 the acid should be 11.5 N \pm 0.2 N. In most cases, the reagent C. P. grade will be found to be higher than this, and this stronger acid reacts more slowly with chromium. This can partially explain frequent high thickness results.

Another more obscure factor has to do with the end point. The end point described by Blum and Olsen¹º is until "evolution (of gas) practically ceased and revealed the exposed nickel." The end point given in the ASTM method¹¹ is "until the first appearance of nickel." Other sources describe the end point as the cessation of gassing. The end point used by most laboratories might be described as the "practical cessation of gassing." Depending on the interpretation of these described end points, a difference of 1 to 3 seconds can be obtained. This can be appreciable when about 11 seconds (at 74°F) represents 0.01 mil of chromium.

Two other factors have seemed apparent to us, although they remain to be verified by others. One is that high results are obtained on heavy deposits, i.e. greater than 0.02 mils. In other words, the action of the hydrochloric acid seems to become slower as the chromium is penetrated. Calculation will show that this cannot be due simply to depletion of acid.

There is also good evidence that the dissolving rate of chromium in the drop of hydrochloric acid increases slightly with increase in the temperature at which the chromium is plated. All other factors remaining the same, this means that "low" thickness results would be obtained on high temperature chromium.

References

- 1. A. H. DuRose & W. J. Pierce, Plating, 43, 239 (1956).
- Paul Magill et al, Air Pollution Handbook, McGraw Hill Book Co., N. Y. (1956).
- 3. Proc. Am. Soc. Testing Mater., 53, 267 (1953).
- Lab. Procedure No. 461H-79; Chrysler Corp., Engineering Div.
- 5. W. McMaster, Metal Finishing, 54, 50 (Nov. 1956).
- 6. G. Sukes, Auto Ind. (Dec. 1, 1957)
- 7. W. Wesley, B. Knapp, Trans. I.M.F., 31, 267 (1954).
- 8. J. Edwards, Prod. Fin., 11, 58 (Mar. 1958).
- 9. H. Brown et al, Plating, 45, 144 (1958).
- 10. Proc. AES, p. 25 (1940)
- 11. ASTM Designation A219-54.

Composition and Application of Anodes

By D. J. Fishlock, Bath, England

This is the second and concluding part of Mr. Fishlock's article. The first part appeared in the February issue.—Ed.

Inert Anodes

It is necessary occasionally to use an insoluble anode in plating. This is chiefly the case when either the anode efficiency greatly exceeds the cathode efficiency, as in chromium plating; when the anode's solubility is impracticably low, as in rhodium plating; or when the cost of anodes is excessive, often the case in precious metal plating. In addition, a proportion of inert anodes may be useful to counter excessive anode dissolution and sometimes to accelerate dissolution by galvanic corrosion. Again, it is sometimes desirable to have an anode of constant size and shape, as in plating the inside of tubular products.

CHROMIUM PLATING ANODES:

The most important use for inert anodes is undoubtedly in chromium plating where, notwithstanding the rather high cost and fragility of sintered chromium anodes, the fact that they would dissolve at 7 to 10 times the rate of cathodic deposition renders their use entirely impracticable. In addition, the very important re-oxidation of tri- to hexavalent chromium, which occurs at the surface of an inert anode, would not take place if the anode were soluble. Many attempts have been made to use a proportion of chromium anode together with inert ones, or chromium alloy anodes. Neither system has proved successful, however, the first largely because chromium anodes are more expensive than chromic acid; and the second because large amounts of metallic impurities are introduced, while the corrosion rate of many such alloys is excessive.

The only anodes of commercial significance at present are lead, lead/tin and lead/antimony, although there has been some application of lead/silver and, lately, of platinum coated titanium.

Antimonial lead, usually containing 5 to 8% Sb, are the first choice, these being much more rigid and offering a greater corrosion resistance to the solution than pure lead ones. The latter, although having good resistance to electrolytic corrosion, tend to corrode rapidly when left unpolarized in the solution and must be removed and rinsed when the bath is idle. Their corrosion resistance is improved, however, by 'anodizing' them in dilute sulphuric acid for 48 hours. This imparts a thick layer of lead peroxide to the surface, which is responsible for the Cr^{III} to Cr^{VI} oxidation. The peroxide film is also formed, of course — although less heavily — in the plating tank. All lead anodes need to be scrubbed frequently to remove the non-conducting lead chromate; this is best done at weekly intervals and with care not to remove the underlying peroxide film which is both protective and conducting. It can easily be demonstrated that the more frequently they are cleaned the less is the overall loss in anode weight.

Badly corroded anodes require more drastic treatment, such as mechanical action, but solutions containing chlorides, e.g., conc. NaCl solution acidified with HCl, greatly assist.¹⁴ Another method is to reduce the

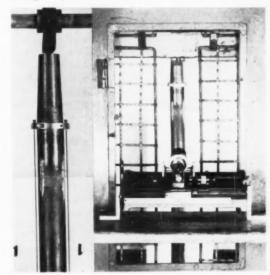


Fig. 5 (above left) Measuring the straightness of a 28' long x 3½" diam, anode for chromium plating gun barrels. This close-up shows the straight Nylon threads, attached at both ends of the barrel.

Fig. 6. (above right) Cathetometer installed in elevator which travels length of anode and measures deviation in Nylon thread shown in Fig. 5.

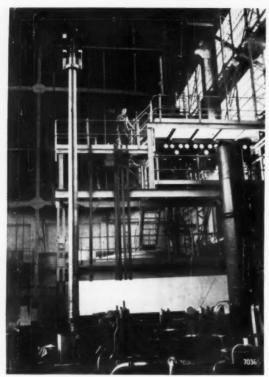


Fig. 7. A six inch gun barrel with its lead plated cadmium-copper anode fitted under tension. This anode carries up to 10,000 amp. during plating.

lead compounds cathodically in an alkaline pyrophosphate solution, $^{\rm 3}$

If the anodes are in operation almost continuously, their antimony content may be reduced economically to 0.5 or 1%. On the other hand solutions using fluoride catalysts need more resistant anodes containing 13 to 20%. Sb. Also in use are Pb:7% Sn alloy anodes for which very high corrosion resistance to fluorides is claimed: Pb:0.2% Te anodes, and silver lead alloys which, although more costly, also have a long life. Quite recently, however, favorable experiments have been made using a titanium anode plated with some 5 millionths of an inch of platinum. This would appear to offer superior strength, conductivity, and corrosion resistance to any of the aforementioned alloys, while its lightness would also prove a major asset.

The design of lead anodes for chromium plating has attracted much attention since they tend to creep severely at high solution temperatures, while their conductivity is poor for the currents they are required to handle. Anodes with heavy reinforcement at the bottom, along edges, and at the solution level, and with heavy gauge hooks — preferably insulated at the joint — are now commonplace. More recent developments have included 'cored' anodes in which the lead is cast, extruded, or electrodeposited around a steel, copper or, lately, aluminum rod to improve its rigidity and conduction. Again, the titanium anode if adopted will obviate such expedients. Cored anodes of considerable magnitude were described by Hammond¹⁵ in connection with the plating of large gun barrels. These were

up to 28 feet long and were required to approach nearly perfect straightness. To measure the deviation a cathetometer mounted in an elevator running the length of the anode was developed (Figs. 5 and 6) and, using a 0.9% cadmium copper alloy core, a maximum bow of less than 0.05'' on a 20' x 11/2'' dia, anode was eventually secured. A point of interest in the use of these anodes is that if the very heavy currents used are applied suddenly they flex or bow (a phenomenon termed anode 'kick') and may short circuit with the gun barrel. Therefore, they are installed under tension (Fig. 7).

Finally, there remains much still to be learned about the corrosion mechanisms in chromium electrolytes, and largely inexplicable failures are even today not uncommon. These may be due to faulty composition, stresses within the alloy, poor distribution of certain constituents, or some entirely unconnected aberration.

MISCELLANEOUS INERT ANODES:

Many materials can be used as inert anodes in specific circumstances. Examples include the use of a few steel anodes, preferably nickel plated, in cadmium solutions to reduce the anode efficiency to 95% and, thus, balance that at the cathode; and in zinc cyanide solutions to improve the corrosion of the zinc by galvanic corrosion, (5 to 10% steel). Lead and lead alloy anodes are quite often used, as are stainless steel, e.g., for precious metal plating where the cost of large anodes can be prohibitive. Platinum, although inordinately costly, is useful for throwing plating into small holes, etc., and, in rhodium plating, proves one of the most inert materials, while silicon-iron is yet another. Two types deserve especial mention, though, these being graphite or carbon and the very recent platinum: titanium.

Several types of carbon anode are in general use, including those made from plates of graphite, from amorphous coal and from coke. The latter, for instance, are formed by bonding commercially pure coke particles under high pressure with pitch. After baking, the anode is exposed in an electric furnace to a temperature high enough to convert all nonvolatile carbon to graphite. Such an anode contains about 99% graphitic carbon and, as a result, its chemical and mechanical disintegration is very slow. It is inert to all elements, including the halogens, with the sole exception of nascent oxygen; its conductivity is high, and erosion in agitated electrolytes slight. Such anodes can find application in almost any plating or related solution except the chromium electrolyte, their chief drawback being an inevitable fragility.

A unique application for carbon anodes occurs in brush plating, ¹⁶ in which very high purity graphite anodes are employed. Although brittle, these score over anodes of the metal being plated on such points as their high conductivity, necessary for the very heavy current densities used; their electrochemical stability; and the absence of any tendency to form poorly conducting surface films. These anodes are water-cooled in all but the smallest sizes.

Titanium anodes are a largely unexplored outlet for this extremely corrosion resistant metal, the latter attribute being due to its natural protective oxide coating. In some non-oxidizing acids, however, the oxide dissolves and corrosion ensues. Early work¹⁷ concentrated on coupling the metal with a more noble cathodic element, e.g. C or Pt, and a potential of 1.5 volts proved effective in combating corrosion in most non-oxidizing acids - in some instances, such as H₂SO₄, reducing it to infinitesimal proportions. Later it was demonstrated that the polarization could be achieved more conveniently by plating the titanium with a very thin and porous platinum film some 0.005 mil thick.18 It is interesting to note that there is no significant corrosion in solutions inimicable to titanium even at the discontinuities. This type of anode has proved very impressive in laboratory trials and two important industrial applications are currently being evaluated: one is as a non-corroding anode for the cathodic protection of steel in sea-water or saline soils: the other is as an anode for chromium plating electrolytes which offers solutions to almost all the limitations of existing ones.

Insoluble Anodes for Nickel Solutions:

There are material advantages to be gained from conducting some plating operations with insoluble anodes, cardinal ones including the fixed anode shape and anode: cathode spacing, and the salutary influence in terms of both agitation and oxidizing action, of the large volumes of oxygen liberated. Two instances of where such advantages can be used to full effect are in continuous plating of strip, wire, etc., and in the plating of tube bores.

A particularly good illustration is the development of a process for depositing thick, very high-grade nickel on the insides of long, small bore tubes for chemical engineering applications. ¹⁹ Other than for the reasons given above, insoluble anodes were used here because (a) in the confines of the tube, anode particles inevitably released from a soluble anode were found not only to cause rough, physically unsound deposits, but the nodules which formed grew so fast that they caused shorts, (b) the anode area must be of appreciably smaller diameter and, therefore, surface area than the cathode and passivity ensures, (c) the anode cost is high, and its dimensions and positioning are critical, and (d) soluble anodes are not compatible with the vital reverse current etching pretreatment.

Insoluble anodes of pure lead and 1% Ag lead alloy were chosen for the short and medium length tubes respectively, and lead plated steel or nickel rods for anodes longer than 5 feet. At least 5 mil and, preferably, 10 mil lead coatings were deemed necessary with a 10-20 mil nickel undercoat on steel. The lead develops a highly conductive brown lead peroxide film during plating which, providing it is occasionally scoured to prevent loose flakes sloughing off, does not interfere with the plating.

The solution was simplified by the omission of chloride ions, normally needed to counter anode passivity; it comprised:

Nickel sulphate	240 g./l.
Sodium sulphate	20 "
Borie acid	30 "

Its pH will naturally fall rapidly as it becomes depleted of nickel ions, and a continuous regeneration system is essential. This was based on nickelous hydroxide additions, (0.03 to 0.04 g./min./amp.), since the only practical alternative, nickel carbonate, introduces CO_2 into the solution, leading to stressed, brittle deposits. High purity hydroxide powder is therefore introduced, most conveniently, into a regeneration system as shown in Fig. 8. The acidity of the solution, although not critical, is advisedly maintained below pH 3 (incoming) and kept as constant as possible throughout the length of the tube by adjusting the rate of flow.

Other salient operating details for this process include a solution temperature of 35°C, in the tube, and a current density of 12 to 20 amp./ft.², depending on the tube's dimensions. In this way, smooth nickel deposits with a Vickers hardness of about 200, an elongation of some 30% and a tensile strength of 30 tons/in.² could be built up to 0.5 inch if required.

Another approach to the problem of regeneration consists of separate electrolytic replenishment using nickel electrodes and a chlorine-free electrolyte. A marked difference in the anode and cathode efficiencies can be arranged, but the problem of anode passivity arises. This is overcome by taking advantage of the short delay before the onset of passivity and using periodic current reversals to maintain the anodic electrode at 100% efficiency.²⁰

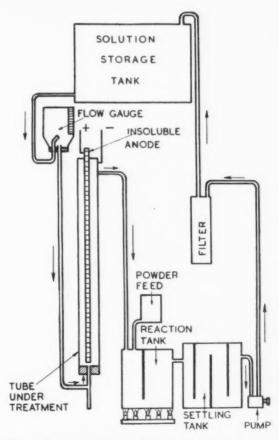


Fig. 8. Diagram of solution circuit for nickel plating with an insoluble anode, based on solution regeneration with nickelous hydoxide.

TABLE 2
Some British Standard Specifications for Anodes

Cadmium B.	S. 2869:1957	Not less than 99.95% Cd; impurities must not exceed 0.05% (Sb $+$ As $+$ Tl not more than 0.01%).
Lead (chemical) _B.	S. 334:1934	Not less than 99.9% Pb, but if Cu is present the Pb content may be reduced by an amount not exceeding the amount of Cu: Max. limits; Ag, 0.002%; Bi, 0.005%; Fe, 0.003%; Sb, 0.002%; Zn, 0.002%; Cu, 0.05%; Ni + Co, 0.001%; Sn, Cd, As, traces.
ZineB.	S. 2656:1956	Max. limits: — Pb, 0.003%; Cd, 0.003%; Hg, 0.004%; Pb + Cd + Hg + Fe, 0.02%.
NickelB.	S. 558:1934	Not less than 99% Ni + Co; Ni, 98.5%; Max. limits:— Fe, 0.75%; Cu, 0.25%; Si, 0.1%; Mn, 0.1%; C, 0.3%; Zn, 0.01%.

Although not widely practiced, since it is clearly more convenient and economical for most plating processes to use soluble anodes notwithstanding their many limitations, inert anode plating can be seen to offer marked advantages in certain instances. Another which might be mentioned is the occasional use of steel or nickel plated anodes for high-speed tin plating from the stannate solution.²¹ Tin anodes must be worked within fairly narrow c.d. limits if the metal is to dissolve as stannate. At high c.d.'s, e.g. above 35 amp./ft.² the anode darkens in color and its efficiency falls. Continuous replenishment is based an anodic regeneration.

Contoured, Auxiliary and Bipolar Anodes

Throwing power and metal distribution limitations present one of the most troublesome aspects of plating

practice — particularly from acid and simple salt solutions. They can sometimes be economically mitigated by using a shaped anode, or a bipolar anode affixed to the plating rack.

CONTOURED ANODES:

These, although the most successful method of obtaining a uniform deposit in solutions of poor throwing power, prove costly in practice. Cast anodes are usually needed, while scrap loss is high and bagging is impracticable. Much more successful have been attempts to arrange normally-shaped anodes to conform with the contours of the work. Twin anode bars each side of the cathode assist in some instances. Another approach, used in the printing trade, is to suspend bar or strip anodes horizontally in curved lead-covered slings to follow the curvature of the printing cylinder. Anode cages for balls, etc. can be shaped to some ex-

TABLE 3
Some Recommendations in Choice of Anodes

Metal	Solution	Anode shape	Anode type	Bag	Comment
Nickel	Bright (organic) *	Oval bars	Cast Carbon	Cotton	Below pH 4.5
	Cobalt-nickel	Oval bars	Depolarized, rolled	Cotton	Maintain adequate c.d.
	Watts	Oval bars	Depolarized, rolled	Cotton	Maintain adequate c.d.
Copper	Acid	Bars or plates	Cast, oxygen free	(none) or Nylon	Pb for inert anodes
	Cyanide	Balls or bars	Rolled high purity	Nylon (if needed)	Some steel often needed, Max. c.d. 20 to 30 amp./ft. ² for copper
Tin	Stannate	4" strips or bars	Cast	None	Maintain yellow film
	Acid	Bars or plates	Cast	None	High efficiency advisable
Speculum	Stannate/cyanide	Oval; separate anodes	Electrolytic Cu; Cast Sn	None	Dual anode circuit
Tin-nickel	Chloride/fluoride	Plates	72:28 cast Sn:Ni	Nylon	Also separate anodes
Tin-zine	Stannate/cyanide	4" wide (max.) strip or oval	75:25 cast Sn:Zn	None	Anodes must be kept filmed
Cadmium	Cyanide	Balls	Pure cast Cd.	None	10% of nickel-plated steel to reduce anode effic.
Zinc	Bright cyanide	Balls or bars	Pure cast Zn	Nylon	Remove when not in use
	Dull cyanide	Balls or bars	Pure cast Zn	None	5 to 10% steel to accelerate anode corrosion
	Acid	Oval bars	Extruded or cast	None	
Chromium	Sulphate	Flat, round or shaped	Cored lead, 6 to 8% Sb	None	'Anodize' before use
	Fluoride	Flat, round or shaped	Cored lead, 7% Sn	None	'Anodize' before use
Silver	Cyanide	Plates, balls or hemispheres	Cast or wrought, and annealed	Nylon	High purity essential $99.97\% +$
Gold	Cyanide	Sheet	Gold, platinum, or stainless steel	None	Remove gold anodes when not polarized
Rhodium	Acid sulphate or phosphate	Sheet	Platinum	None	Completely inert

^{*}Vendors recommendations should be followed.

tent, to follow the line of the cathode or of a plating barrel. Again, by using selective-cell plating, the anodes can be arranged around all walls of the cell if needed; this has been used for the automatic plating of large bumber bars.

AUXILIARY ANODES:

These are widely used, especially in hard chromium plating and electroforming. The auxiliary anodes are usually connected by a flexible lead to the positive supply, but arranged through their resistivity to carry only a calculated proportion of the current because of their usually close proximity to the cathode; this can be effected through the anode's resistivity. Occasionally, however, it is expedient to operate auxiliary anodes from a separate anode supply. Typical applications are for plating concave and large flat surfaces and, of course, deep recesses.

BIPOLAR ANODES:

Bipolarity arises through the inclination of the plating current to take a lower resistance metallic path through the solution, if one is available, than to traverse the relatively high-resistance electrolyte. Metal will begin to deposit on uninsulated metallic areas frequently the tank walls - near the anode, which, thus, becomes an induced cathode; there will then arise an equivalent tendency to the tank wall nearest the cathode to corrode anodically. The phenomenon is easily demonstrated by floating a thin-walled, watertight copper drum just below the surface of an acid copper electrolyte by carefully adjusting the electrolyte's density. When current is applied between the two electrodes a slow rotation occurs, due to deposition on one side and dissolution from the other. The principle is also used in series copper refining.

In order to utilize the phenomenon to improve the distribution of an electrodeposit, the plating rack is constructed with a collecting plate located near the anodes. This picks up the current and conducts it through an insulated connector to the bipolar anode, which is located in, for instance, a concave portion of the cathode surface; thus, a higher proportion of the current is 'shorted' to this region. The deposit thickness can be controlled by the size and resistivity of the anode and the collecting plate. A soluble bipolar anode may be used but, if its shape is complex to conform with an irregular contour, an inert anode is more convenient. Such a system is eminently practicable in both manual and automatic plants.

Summary

It is hoped that this article will have helped to emphasize the significance of anodes and anodic reactions in any plating process, these paralleling the importance of the deposition mechanism itself. Much progress has been made in recent years towards improved anodes, this progress having been catalyzed by metal restrictions and high prices. There remains an enormous field still to be explored, however; optimum anode shapes, sizes, compositions, and structures for different plating electrolytes remain far from fully classifiable. Some of the directions in which development is still urgently needed have recently been mentioned by James.²² On the theoretical side, investigations into anodic reactions are currently in progress in several universities, particularly in Britain, and their results will surely contribute to fewer plating problems in the future.

Acknowledgment

British Crown Copyright reserved; Figs. 5, 6, 7 and 8 reproduced by permission of the Controller of her Brittanic Majesty's Stationary Office.

References

- 1. Electroplating Engineering Handbook, Ed. by A. K. Graham, Reinhold (1955).
- 2. R. P. Nevers et al., 41st Proc. Am. Electropl. Soc. (1954). 3. Modern Electroplating, Ed. by A. G. Gray, John Wiley
- 4. Tin-nickel Alloy Plating, Tin Research Inst. (1952).
- 5. E. R. Thews, Metal Industry (Aug. 15, 1947).
- 6. U.S. Patent 2,698,216.
- 7. E. R. Thews, Metal Industry (Aug. 29, 1947).
- 8. C. J. Swanson, Trans. Inst. Met. Fin., 29 (1953).
- 9. Metal Finishing Productivity Report (1951).
- 10. E. L. Taylor, The Performance of High Purity Electrolytic Nickel Anodes, Electrodepositors' Tech. Soc. (1939).
- 11. Efco-Udylite Review, Electrochemical Engineering Co. Ltd., Vol. 1, No. 2 (1958).
- 12. The Filtration & Pumping of Plating Solutions, G. T. Colgate, R. Draper, London (1953).
- 13. Electroplating Engineering Handbook, Ed. by A. K.
- Graham, Reinhold 1955).
- 14. E. R. Thews, Metal Industry (Oct. 24, 1947). 15. R. A. F. Hammond, Trans. Inst. Met. Finishing, 34 (1957).
- 16. H. D. Hughes, Trans. Inst. Met. Finishing, 33 (1956).
- 17. J. B. Cotton, Chemistry & Industry, p. 68-69 (1958).
- 18. J. B. Cotton, Chemistry & Industry, p. 492-3 (1958). 19. A. W. Hothersall and G. E. Gardam, J. Electrodepositors'
- Tech. Soc., 27 (1951).
- 20. W. A. Wesley et al., Plating, p. 1243 (Dec. 1951).
- 21. A. W. Hothersall et al, Intern. Tin Research Council Development Pub A-1.
- 22. C. James, Prod. Finishing (Br.), 9, No. 5 (1956).

How to Specify a Painted Finish

By Allen E. Heyson, General Electric Co., Plainville, Conn.

A SUCCESSFUL designer of industrial apparatus realizes that painted surfaces are a vital part of a design. Failure of a finish to maintain its decorative or corrosion resistant properties cannot be tolerated! Therefore, the same careful attention must be given to defining the *finish* requirements as given to other materials and components in the design. The way to do this is to write a good specification.

There are several different approaches to defining a finish. One is to specify the paint supplier's designation. This would be known as a trade name specification. This is not good practice for the following

- 1. Does not allow for competitive bidding,
- Strikes or catastrophies to the supplier's plant can disrupt production.
- 3. A supplier may make changes in the composition of the paint without changing his designation. This may have a detrimental effect on the finishing processes not anticipated by the supplier. (It should be mentioned, however, that most reputable suppliers make no change in the paint composition without notifying their customers.)
- Provides no means for inspection to check the quality of the paint.

Another approach is the composition type of specification. Some of the disadvantages of this type of specification are:

- Restricts the supplier from making improvements in the quality of his paint or lowering his costs.
- Very specialized knowledge is required to write composition paint specifications which is usually available only in large companies.
- Analytical procedures are complicated and for some ingredients accurate analysis is not presently possible.

The approaches discussed have been in terms of paint as a wet material. However, design engineering is concerned only with the properties of dry film on the product and not the properties of liquid paint. This is in line with the general organization philosophy that engineering should be responsible for defining the final product but not the way the product is made. An acceptable finish could be produced from a variety of compositions and a number of different processes as illustrated in Figure 1. Thus, the logical approach is for Engineering to specify only the desired end result.

Figure 2 shows a finish specification used by G.E. Company's Distribution Assemblies Department. This is the standard finish for all product lines. We will now

examine some of the reasons for the various requirements.

There are many reasons for selecting A.S.A. colors. The colors harmonize well on two-tone products; they have good customer acceptance and reduce to a very small percentage the number of special colors required. Probably all major industrial paint suppliers have had experience matching ASA colors. These color control chips are available from the American Standards Association. Another advantage is to be able to match equipment finished by other manufacturers. However, since the eye is extremely sensitive to small differences in appearance, a perfect match cannot usually be obtained.

For many installations, minimum reflectance is preferred. This is because it is easier to match touch-up work with a lower gloss and minor surface imperfections, which are often inherent in materials such as hot rolled steel, are not highlighted by the finish.

The performance requirements shown in Figure 2 were developed through a cooperative testing program with one of our suppliers. Additional tests are now underway in our laboratories to refine, if necessary, these requirements,

It is recognized that this is not an 'iron-clad' specification. Suppliers cannot determine the paint to furnish simply from such specifications. They must work with the people in the finishing department to select a paint best suited for the equipment available. In this manner, the know how and technical service of the paint supplier is utilized. This appears to be an effective way for private industry to operate.

The procedure suggested has been found to be the best and most practical approach to meet this need. The quality required has been described and at the same time unnecessary restrictions have not been

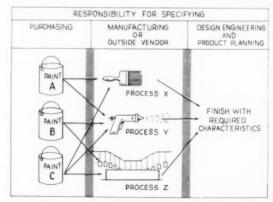


Fig. 1. Schematic representation showing areas wherein lie specification responsibilities.

GRAY ORGANIC FINISH

Supersedes F50KD3-S1

G-E Finish F50KD3 identifies ASA gray organic finishes, as follows:

F50KD3A - Light, ASA #61 F50KD3B - Medium Light, ASA #49

			F50KD3A		F50KD3B
COLOR	(1)				
			8.3G 6.10/0.54	10BG	4.90/0.60
			6.3G - 0.3BG	8.3BG	- 1.7B
			6.04 - 6.16		- 5.02
			0.34 - 0.74		- 0.80
			le from Purchasing Age		
LOSS					
	Range				30-40
THICK					
	Including und	ercoat, min, in	ich		0.0008
PROPER	TIES:				
	Salt spray re	sistance, hours	, min		100
			ng/cycle, max		0.500
			all show no signs of f		
		after 90 deg.	bend around 1/8 inch	ii ameter	
	mandrel.				
A NUFA	CTURE:				
			used to produce this		all be
	designed to	best suit the	finisher's facilities,		
	Toytumo aball	not owened 32	microinches (32) deter	mined ha	gi cht
			oughness specimens.	milled by	SIENT
	and reer con	mparison with i	roughness specimens.		
		rfaces there sh	-		
		nd gouges showl	ng base metal		
		or rack marks			
			excess of texture		
		listers and pit			
	Runs and pu	ddles resulting	g from drainage.		
REFERE	EE METHODS:				
	Abrasion -				EXPAYA
	Preparation	of test panels			EYAZA
PACKII	G AND MARKING:				
PACKII	All materia	l shall be ship	oped in suitable conta	iners to	give adequate
PACKII	All materia protection	l shall be ship n during transi	it.		
PACKII	All materia protection All contain	l shall be ship on during transi mers shall be le	-	purchase	order numbers

Fig. 2.

placed on the composition, the source of supply and the finishing process. New paints and processes may be used without extensive investigation as long as the quality specified is maintained.

August 4, 1958

The careful specification of the finish plays an im-

portant part in the over-all success of a product. Too often, the specification of the finish is all but disregarded as a design is readied for production. If the customer is vitally concerned, can design engineering afford not to be?

D-156

Improved Fluorescent Paints Expand Their Engineering Uses

By Norman I. Gaynes

TO an accustomed air traveler on the commercial lines, it is not surprising to find his plane circling over a point such as Youngstown, Ohio for many minutes while the air lanes are cleared. At this junction point where flight paths converge, this is normal operating procedure.

In the relatively recent past one can still recall the collision of two large airliners over the Grand Canyon in a more isolated area than Youngstown, Ohio.

The experienced air traveler can easily envisage the possible "traffic jams" of the future. This of course is confined to commercial travel but, when private and military planes are added to this ever growing airplane population, it becomes quite evident that corrective procedures must be instituted.

The boating industry, that is, particularly that portion of the industry devoted to the pleasure boatman, has also become alarmingly concerned with the almost unbelievable expansion of small boat ownership. For that reason, even though only an insignificant start, the Bonner Bill Public Law 85-91 was welcomed wholeheartedly when passed by the Congress.

The finishing industry has responded to its responsibility in this ever growing crisis with its contribution to prevention of collisions on the sea and in the air with the introduction of fluorescent or "safety" paints.

During the periods of dawn, dusk and generally overcast sky conditions most conventional colors, as typified by pigmented lacquers and enamels, will appear as a grayish cast. With the basic background of overcast, the grayish hue of airplanes and ships at sea tend to become "lost" and blend with the surrounding conditions. Fluorescent paints, by their very singular nature, actually are accentuated in the visible range on these occasions of low visibility. The term "flying neon" has been aptly applied to this new development.

Fluorescent paints have actually been available for some years. However, the greatest handicap has been the rapid deterioration of its most important asset, that of fluorescence itself. Previously, in order to achieve the maximum effect, it was necessary to recoat with fluorescent paint in a matter of days or at most, weeks. This of course proved to be far too costly and impractical. It was necessary therefore to improve on this particular phase before the application of fluorescent paints could become an accepted practical reality.

In order to understand the basic mechanism of this type paint it is necessary to contrast the fluorescent pigment with the conventional pigments now in lacquers and enamels. The normal pigments in most cases are inorganic metallic compounds such as Titanium Dioxide (white), Iron Oxide (red), Lead Chromate (yellow), Zinc Chromate (yellow), Chromium Oxide (green), etc. These are opaque type pigments produced by closely controlled unit operations and processes. The pigments will then be uniform in all properties of shade, undertone, strength, and ease of grinding.

Organic pigments are obtained when compound groupings such as NO₂, Azo, etc., called "chromophore" or color bearing, are joined to the coal tar or benzene ring. These insoluble dyes when precipitated with inorganic carriers such as aluminum hydroxide, barium sulfate etc., form "lakes." The organic pigments or lakes are not usually as opaque as the inorganic variety.

Regardless of which of the aforementioned pigment type is utilized, whether organic or inorganic, it is necessary to grind the pigment in a ball mill or on a roller mill or some other suitable method wherein the particle size is reduced to an extent which allows the production of smooth easy flowing paints. It should be borne in mind that reduction in particle size is performed on the pigment itself.

Fluorescent pigments are radically different than the conventional variety. Actually they consist of a bright fluorescent dye dispersed in a thermosetting resin which is then cured to a solid polymerized state. In essence, this pigment consists of particles of dye in particles of solid clear resin. Thus, when grinding is performed on this pigment, the reduction in particle size is that of the carrier resin solid rather than the dye itself. As is typical with the organic class, this pigment, even more so by its very nature, is extremely transparent. In order to obtain the optimum results therefore it is necessary to apply a white undercoat of high reflectivity value so that any light transmitted through the transparent fluorescent film will be reflected back through the brilliant color coating.

Formulation of fluorescent paints has lent many problems to the paint chemist. The choice of vehicles is extremely limited. For example, nitrocellulose lacquers require active solvents such as ketones and esters. These active solvents dissolve the carrier resin and the dyes in the fluorescent pigment. As a result, lacquers and similar vehicles requiring active solvents are precluded.

The field is narrowed to those resins soluble in hydrocarbons, such as toluol, xylol and mineral spirits, whose outdoor durability is exceptional and outstanding. In addition the initial color of the wet resin should be as close to water white as possible. Thus phenolic resins as a class example, with their darker color and yellowing tendencies, could not be considered acceptable for this application.

Speed of dry is also an important consideration and, while many long oil alkyds offer improved durability on outdoor exposure, the time required for adequate curing has been a limiting factor in this consideration. Oxidizing alkyds of the shorter oil lengths have produced excellent test results in many of the investigations conducted, but the number of coats required for maximum results gives rise to the fear of "lifting" on recoating.

Fluorescent pigments have shown themselves to be subject to accelerated deterioration in high moisture conditions. In addition, therefore, it is necessary to utilize a resin vehicle which is highly resistant to moisture penetration and attack.

For the aircraft industry additional qualifications must be included. Highly chemical resistant vehicles must be chosen which register high resistance to the many fuels available. It is also well known that aluminum is attacked by caustic soda so that strong strippers cannot be used. Simple recoating without stripping would over a period of years provide an excess of "drag" weight.

While not the ultimate in results, it has been found that acrylic ester resins offer the best possibilities as the compromise candidate which most nearly represents all the desired qualities. For this reason most formulations, including specifications MIL-P-21600 and MIL-P-21563, contain acrylic esters as the vehicle component.

It has been found that fluorescent pigments deteriorate most rapidly in the presence of ultra violet light, that is, the short invisible rays of the spectrum whose wavelength is less than 4000 Angstom units or 400 millimicrons. The area from 4000 Å to 7700 Å comprises the visible spectrum ranging from violet to red respectively. Above 7700 Å we are in the invisible range known as infra red. For the purposes of our discussion we are interested only in the range below 4000 Å where the greatest deterioration of fluorescent pigments takes place.

In recent years it has been found that chemical compounds of the substituted benzophenone class, when incorporated into a protective film or coating, act as screens or shields against the light waves in the ultra violet region. These materials have the unique distinction of absorbing the ultra violet with little or no transmission over most of the range. It has therefore been considered a prerequisite for good fluorescent finishing to topcoat the pigmented film with an acrylic ester clear containing ultra violet stabilizers. Of course this clear topcoat also acts as an impervious protective barrier against moisture penetration.

Application of the fluorescent paint system is an important aspect of the success and durability of the product. The metal substrate should first be protected with a corrosion inhibiting primer of the zinc chromate type. Should the white undercoat be of the nitrocellulose-acrylic type such as required by MIL-P-21600 it is mandatory that a lacquer type zinc chromate primer be used conforming to specification MIL-P-7962. Otherwise, for the regular high reflective lacquer undercoat, MIL-P-6889A Zinc Chromate is desirable. The white undercoat is applied in a dry film thickness of 1.0 to 1.5 mils. In aircraft finishing the minimum is preferable, providing that good opacity and high reflectivity has been obtained. On boats and display applications the maximum is desired.

Film thickness of the fluorescent paint itself has been found to be of extreme importance not only for obtaining the full brilliance of color but also in the durability and fluorescent retention of the color. As was pointed out previously, fluorescent coatings are very transparent and dry film thicknesses of 2.8-3.2 mils are required in order to achieve full hiding and maximum properties. Normally two or three coats may be necessary to obtain the desired thickness.

The clear topcoat should be applied after at least a four hour drying period for the multiple pigmented coats. In most cases a 24 hour period would be preferable. For aircraft use, where the minimum is the rule to be observed, a dry film thickness is no handicap to flying speed, a greater film thickness may be utilized, which will provide more ultra violet screening effect and better moisture resistance.

Government agencies have been quick to adopt "Safety in the Can" as an effective means of reducing possible collisions. One such agency, the Air Training Command has reported the astounding reduction of 75% in mid air accidents. For this reason it has been found that, even though an increase in film thickness under specification MIL-F-5055 from 1.5 mils to 4.0 mils is necessary, the safety results warrant the increase.

The U. S. Coast Guard has found that painting of (Continued on page 65)

Spray Booths and Oven on Stilts Solve Space and Quality Problems

By Ira Findley, Industrial Representative, Manufacturers Light and Heat Company

COMBINED problems of air-borne paint escaping in the general plant from an enamel spraying operation, occasional damage to product finish from dust contamination and space heating complications were solved simultaneously with the installation of two gas-heated isolation spray booths at Hancock Manufacturing Company, Toronto, Ohio.

At the same time, Hancock also put in a new 1.8 million btu gas-heated drying oven to handle increased production. To ease a floor space shortage, the new 60-ft. long oven was erected on ten foot stilts over an existing work area.

Hancock manufactures various metal stampings such as signs, lighting fixtures, and products for the automotive trade, where a high quality finish is essential.

Before installing the balanced and conditioned spray booths, spraying was done in a section of the plant set off by a floor to ceiling partition. To prevent paint from migrating into the plant, a blower was installed which vented the air in the paint area to the outside. During the colder months of the year the draft created by the blower drew in sufficient cold air to make working conditions uncomfortable in certain parts of the plant. Dust, drawn in from the outside, also created problems during the summer.

Here are the details of how Hancock solved the problem: Two booths were constructed, one for prime coat and one for the finish coat. A drying space between the booth, where there is a curve in the conveyor line, allows a four minute drying period.

Booth number one is ten feet square; booth number two is twenty feet long and ten feet wide. Work comes into the small booth, is sprayed with a flash coat, passes through the drying area and into the large booth where an operator puts on the finish coat. From there the conveyor carries the work to the automatic drying oven.

Both booths are heated and carefully balanced with respect to negative pressure. Air to be conditioned for the booths enters through a duct on the roof of the building, drawn in by two blowers, one with a capacity of 22,500 CFM and the other, 13,750 CFM. It is heated by two natural gas burners with respective capacities of 1,950,000 btu and 1,200,000 btu, located, with the blowers, in a small house on the roof of the plant. Heat output of the burners is regulated by a thermo potentiometer in the air intake duct. Air in the booths is maintained at $80^\circ\mathrm{F}$. $\pm~20^\circ\mathrm{F}$. After the air is heated on the roof, it passes down the intake duct and into the booths through a Fiberglas filter



New 1.8 million btu, gas-heated drying oven. The 60 ft. long oven was erected on ten foot stilts over an existing work area to solve floor-space problem.



The pressure within this gas-heated isolation spray booth is precisely balanced with respect to the air in the plant.

occupying one wall of the booth. A fan in the exhaust stack then draws the air through a 550-1100 gpm recirculating water screen on the opposite side of the booth, through a series of baffles, and finally vents it into the outside atmosphere. A damper in the exhaust stack, automatically regulated, keeps air in the booth in balance with the rest of the plant.

The finished ware is conveyed to the drying oven in 3 minutes. The trip through the 240 ft. oven, which is operating at 250°F., requires 30 minutes.

Air, heated by a 1,800,000 btu maximum capacity burner at one end of the oven, is ducted through and over the conveyorized work. Fifty to eighty per cent of the spent air as continuously exhausted. Sufficient fresh air is added to the unexhausted air to



Finished coat is applied in second spray booth. Since the booths were installed the quality of finish of Hancock's products is so high that rejects due to dust are practically non-existent.

keep the percentage of volatiles low and the combined air is returned to the heater and recirculated.

The percentage of air exhausted from the drying oven is determined by a manual damper control on an exhaust and seal fan with a capacity of 6,800 CFM. Through the recirculation of up to 50% of this heated air the full cost for operation of the drying oven is relatively low.

Since installation of the spray booths and ovens, the quality of finish on the complete range of Hancock's products has improved to the point where Hancock says its tests show that rejects, due to dust, are practically non-existent and the quality of surface is excellent.

FLUORESCENT PAINTS

(Continued from page 63)

crash helmets, floats etc., renders them visible in the most overcast conditions when normally they would be lost to view in the gray sea.

The safety aspect has been stressed here to a great extent but the attention-getting value of fluorescent colors has found many uses in displays and advertising. At the recent Retail Paint and Wallpaper Dealers Show in Cleveland a combination of fluorescent paint and the also relatively new multicolor enamels was shown to present some new and exceedingly interesting possibilities.

For display purposes where maximum fluorescence for safety is not the most important factor, it has been found that minute quantities of pigments such as phthalocyanine blues and greens incorporated with the fluorescent pigments will produce startling variations of colors which are still 4 to 5 times brighter than conventional paints.

There is still much to be done with fluorescent pigments. Development of dyes which are more light-fast and less sensitive to deterioration is, of course, the first step. New methods of pigment manufacture which would render the fluorescent resin mixture insensitive to active solvents is another step. Thus, their use in nitrocellulose lacquers would become feasible. These and many other refinements are sure to increase the wide usage of these unique materials in which only the barest dent has been made.

Bibliography

- MIL-P.21563 (Aer) Paint System Fluorescent, for Aircraft Application.
- MH. P 21650 (Aer) Paint, Fluorescent, Removable, for Aircraft Use.
- Norris, James F., "Principles of Organic Chemistry," Me-Graw-Hill, 1936.
- Shreve, R. Norris, "The Chemical Process Industries", McGraw-Hill, 1945.
- Cowling, Jack E., and Noonan, Frank M., "Development of High Visibility Paints," U. S. Naval Research Laboratory Paper #13.
- Switzer, Joseph L. & Robert C. U. S. P. #2,475,529.
 Switzer, Joseph L. & Robert C. U. S. P. #2,498,592.
- 8. "Scientific Encyclopedia," D. Van Nostrand, 1938.
- Perry, John H., "Chemical Engineers Handbook," Mc-Graw-Hill, 1955.

FINISHING POINTERS

Specific Gravity of Sulfuric Acid — Aluminum Sulfate Solutions

By J. B. Mohler

Seattle, Washington

JUST as the slide rule is the everyday tool of the engineer, and the steel scale is the tool of the machinist, so is the hydrometer the tool of the control operator of the heavy chemical industry. Dropping a hydrometer into a vat of solution is the easiest method of determining the salt content. When a single chemical is dissolved the method is quite accurate. However, it is also accurate when two chemicals are present and the concentration of one is known. In fact this method is useful when more than two chemicals are present in that it measures the total chemical concentration. At least one chemical then can be determined by difference, that is by analyzing for all other chemicals and subtracting these from the total. A simple gravity reading then can eliminate one analysis. One thing is needed to apply the method, namely: specific gravity data.

The specific gravities of sulfuric acid — aluminum sulfate solutions are of interest since these are the major chemicals present in a sulfuric acid anodizing bath.

A number of solutions were made up from reagent grade chemicals and specific gravities were taken at various temperatures as shown in the table. By inspection the following formula will express these data:

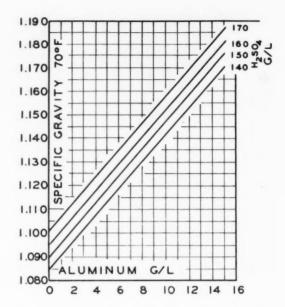
Specific Gravity = 1.000 + 0.00060A + 0.0057B + 0.0003 (70-T) Where:

$$\begin{array}{ll} A \ = \ H_2SO_4 & g./l. \\ B \ = \ Al & g./l. \\ T \ = \ Temp. & °F. \end{array}$$

The table shows the comparisons of the measured and calculated values. Previous specific gravity meas-

Specific Gravity of Sulfuric Acid-Aluminum Sulfate Solutions

H_iSO_1	41		Specific	Gravity
g./L.	g./L.	0 F	meas.	calc.
0	9.7	70	1.061	1.055
174	0.0	70	1.104	1.104
87	4.9	70	1.082	1.080
175	4.9	70	1.131	1.133
175	9.7	70	1.159	1.160
175	4.9	106	1.120	1.122
175	9.7	116	1.149	1.146



urements have shown that the increase in specific gravity is almost linear with increasing salt content and with decreasing temperature. The deviation from linearity is small within a limited range and, therefore, only enough data need be taken to determine the constants in the above equation.

The graph, constructed from the equation, can be used in several ways. If sulfuric acid is determined (by titrating a sample with sodium hydroxide to a methyl orange end-point), then aluminum can be estimated from a specific gravity reading. If aluminum and sulfuric acid are both determined by titration, then a large deviation from the expected specific gravity is an indication of the presence of impurities.

Suggested limits for a sulfuric acid anodizing bath are:

The initial specific gravity should be about 1.097 and the bath can be operated, with proper control, until the specific gravity rises to about 1.185. The increase in specific gravity should be proportional to the increase in aluminum and, therefore, proportional to the ampere-hours as well as the consumption of sulfuric acid.

An occasional specific gravity reading, taken and entered in the log, serves as a rapid over-all means of checking expected performance of a sulfuric acid anodizing bath. ,

Records of the increase in aluminum and the work loads will reveal the life of the bath in terms of the quantity of current passed. This, in turn, is related to the total area anodized (in a given anodizing time). The data, including determinations of acidity, will also indicate the necessary frequency of additions to maintain recommended concentration limits.

Science for Electroplaters

45. SULFAMIC ACID

By L. Serota

THE use of sulfamic acid in electrodeposition is a relatively recent development. Although its properties have been studied for the past sixty years, and a number of synthetic procedures developed for laboratory study, industrial application had its beginning with the production of sulfamic acid in 1937 in the United States by a patented process, based upon the reaction of urea with fuming sulfuric acid. The equation for this reaction may be represented in the following simple form:

$$H_2NCONH_2 + H_2SO_4 + SO_3 \rightarrow$$

 $2HOSO_2NH_2 + CO_2$

A number of plating operations from sulfamate solutions were reported in the ensuing years. R. Piontelli and his co-workers in Milan, Italy, referred, in 1938, to nickel plating from sulfamate solutions and a patent was issued to M. E. Cupery in 1943 for plating copper, nickel and lead from sulfamate baths. A significant development in commercial processes was the introduction, in 1950, by R. C. Barrett of a nickel sulfamate process for electrotyping and electroforming.

Additional reports of industrial application include a lead refining process with lead sulfamate baths by Piontelli (1948); a patented lead (sulfamate) plating process reported by E. W. Schweiker in 1942, and a report by W. S. Murray in 1944 of an efficient indium sulfamate (acid) bath. S. Tajima referred in 1952 to the

process of anodizing with sulfamic acid. Mention was also made by the author that, prior to this research in Japan, the sulfamic acid anodizing process for aluminum was suggested by W. E. Gordon and M. C. Cupery in 1939, and that an Italian patent was granted Piontelli in 1942 for the sulfamic acid anodizing process.

Sulfamic acid is a strong inorganic acid. It is a white crystalline, non-hygroscopic, non-volatile, relatively non-toxic product, easy to handle and store. Structurally it is similar to sulfuric acid, with substitution of an amino group (NH₂) for one of the hydroxyl groups in sulfuric acid. The structural formula for sulfamic acid would be represented as

Cupery notes that the formula ${\rm H_3+NSO_2 \cdot O^-}$ is suggested as representing more accurately the solid form. The acid is somewhat soluble in water (about 20 grams per 100 grams water at 25°C.) but virtually insoluble in 70-100 per cent sulfuric acid. Aqueous solutions of sulfamic acid show a degree of ionization that compares with the pH range of the common mineral acids (Fig. 182).

Water solutions of sulfamic acid are quite stable at ordinary temperatures but, at higher temperatures (80°C.) and low pH, will hydrolize slowly to ammonium acid sulfate. Sulfamic acid is, however, less reactive toward amphoteric or acidic metal oxides. The solubility of nickel sulfamate, for example, is such that re-crystallization from solution cannot be satisfactorily achieved. This property of high solubility accounts for the operation of sulfamate baths with a high metal content and corresponding high current densities.

Lead Baths

The need for a satisfactory new plating process, owing to the metal shortage during the war program period, led to the development in 1942 in the United States by Schweikher of a (patented) lead sulfamate process. The principal reagents for this bath included lead sulfamate, Pb(SO₃NH₂)₂, addition agents, and sufficient sulfamic acid to maintain a pH of about 1.5. Consistent production of good quality lead deposits was reported. Addition agents were required to yield deposits that were smooth and uniform in appearance. An important advantage for this bath is the excellent solubility of lead sulfamate, thus making possible a high metal content (15-22 oz./gal.) and a wide range of current density (5 - 40 amp./ft.2). Another advantage is the fact that the stable bath salts can be shipped as solid, non-corrosive materials. Preparation of the bath simply entails dissolving the acid and salt in water.

Deposits are affected very little by suspended matter. Thicknesses of 0.003 inch are easily produced. The deposits are smooth, free of trees, ductile, and do not exhibit embrittlement up to thicknesses of ½ inch. F. C. Mathers noted, as a disadvantage in the operation of this bath, the tendency of the sulfamate to decompose, forming lead sulfate, which settles out. This condition was not considered serious at low temperatures and a low free acid concentration. Cathode and anode efficiencies were 100 per cent.

Piontelli referred (1948) to the development before the war in Italy of lead refining with a sulfamate bath. The successful operation of this process on a pilot plant scale led to the installation of an industrial unit. The bath composition included 80 g./l. lead, 100 g./l. free sulfamic acid, plus an addition agent. A current density of 120-100 amp./m.2 was used. Particular note was taken of the fact that the tin content of the (secondary) lead anode used (95 per cent pure) did not affect the deposit when the concentration in the bath was less than one per cent. An added advantage noted for this solution was that bismuth, copper, and silver did not interfere with the deposit. The investigations of Piontelli and his associates account for the wide use of the sulfamate bath in Europe.

F. C. Mathers and B. B. Forney, in a study (1939) of addition agents for a lead sulfamate bath, proposed the following proportions: With 5.4 grams of lead as lead sulfamate and 5 grams sulfamic acid per 100 cc. water, the

	Sulfamate	Nitrate	Acetate	Chloride	Sulfate
Ammonium	193	214.2	234	39.3	76.7
Sodium	106	91 75.4	50	36	28
Magnesium	119	75.4	65.5	36 56.7	26.9
Calcium	67	138	34.2	90	0.208
Barium	34.2	10.4	77.3	37	0.00026
Zine ·	115	126	44.5	425	57.9
Lead	218	58	55	1.08	0.004

Fig. 182. Solubility of Sulfamate Salts (Gram Salt per 100 Grams Water) at 25°C.

quantities and names of some addition agents (per 100 cc.) which gave smooth, finely crystalline tough deposits are: 0.07 g. beta-naphthol; 0.7 g. aloin; 0.05 g. casein + 0.1 g. aloin; 5 g. malic acid + 0.1 g. aloin; 0.5 g. pyrogallol + 0.7 g. aloin; 10 drops cresylic acid.

A. G. Gray reported (1944) that a deposit of 0.001 inch thickness of lead was obtained in 20 minutes from a lead sulfamate bath (50 oz./gal.) with a current density of 20 amp./ft.2 For comparison, the following time cycles for depositing the same thickness for different metals were given: nickel, 56 minutes; copper, 53 minutes: zinc. 41 minutes: and cadmium, 30 minutes. The suggestion was advanced that a prior copper strike will insure a clean surface for the lead deposit and provide better adhesion to the basis metal. A 0.0001 inch or less copper flash seemed to improve the corrosion resistance of the deposited lead.

Nickel Baths

The increasing commercial use of the nickel sulfamate bath is attributed to the pronounced characteristic advantages this bath possesses over the commonly used nickel baths. The unique quality of low stress exhibited, in contrast to nickel deposits from chloride and high chloride Watt's bath where an internal tensile stress as high as 60,000 psi has been recorded, makes the nickel sulfamate bath especially adaptable to electroforming and electrotyping operations.

It was further observed that the use of certain organic addition agents induced low internal or zero stress, or even stresses in the compressive direction instead of the tensile, A. Brenner cited as examples the use of sodium naphthalene sulfonate or saccharin as brighteners in bright nickel deposits achieving this effect; and M. B. Diggin, in describing a nickel sulfamatechloride bath, listed naphthalene trisulfonic acid compounds as addition agents producing this property in the nickel deposit.

Since 1950 over 26,000 gallons of nickel sulfamate baths in some 50 plants have been reported in operation in the United States, with approximately half of these units used by the electrotype industry.

The composition of a basic solution recommended by Barrett, one that will deposit nickel of medium hardness (250-350 VHN) and low internal stress, consisted of nickel sulfamate, 60 oz./gal.; nickel metal content, 10.2 oz./gal.; boric acid, 4 oz./gal.; antipit agent, 0.05 oz./gal.; pH (colorimetric) 3.0-5.0; maximum current density up to 300 amp./ft.² at 140°F. 150 at 100°.

Modification of composition or operating conditions, including recommended addition agents, will permit, it was claimed, adjustment of such physical properties of deposited nickel as increase in hardness up to 550 VHN, control of stress in the compressive range, increase in tensile strength, and semi-bright to full-bright appearance.

Nickel sulfamate may be prepared by mixing nickel carbonate with a solution of sulfamic acid, in equivalent amounts.

$$NiCO_3 + 2NH_2 SO_3H \rightarrow$$

 $Ni(H_2NSO_3H)_2 + H_2O + CO_2$.

The nickel sulfamate-chloride bath reported by Diggin in 1954 contains. in addition to nickel sulfamate, nickel chloride, which it was claimed promoted anode corrosion, thereby reducing harmful oxidizing effects at the anode. The recommended addition agent increased hardness, tensile strength, and electrical resistivity, and changed the internal stress of the deposit from tensile to compressive. Recommended operating conditions include: Temperature 70-160°F.; current density 20-140 amp./ft.2; pH 3.5-4.2 electrometric: air agitation: continuous filtration. A comparison of the composition of three nickel sulfamate baths, the Barrett solution and two Diggin solutions (designated as Bath 1 and Bath 2) is shown in

The question of chlorides in a nickel sulfamate bath arose during the discussion period following the reading of a paper on nickel plating from a sulfamate bath. In connection with the ability to produce, continuously, a deposit in compressive stress if chlorides

are present, it was stated that organic addition agents must be present to achieve this condition, and that the presence (or use) of chlorides in a bath in the absence of the additive will tend to increase the tensile stress of the plated nickel by about 3,000 psi for each 10 per cent increase of nickel as nickel chloride.

Industrial, apart from decorative, applications of nickel deposits from the sulfamate solution include: electroforming of wave-guides; resizing or building up of worn or poorly machined parts, since the hardness can be adjusted to about 550 Vickers; phonograph record stampers; stereotype and electrotype plates; leather embossing dies; electroforming of various types of tubing, with the added factor of little, if any, reduction of fatigue strength. As an example of this characteristic, nickel deposits from a Watt's bath with high tensile strength have been known to cause up to 46 per cent reduction in fatigue strength in steel and aluminum alloys used in the aircraft industry, whereas, nickel deposits from a sulfamate bath (in compression) will not affect fatigue strength of the basis metal adversely.

Indium

A sulfamate bath was recently developed to provide an efficient acid bath from which indium may be electrodeposited. The bath, reported by W. S. Murray, is claimed to have a lower inventory value and higher cathode efficiency than other indium baths in use. The concentration of indium metal is 20 gm./l. or about 21/2 oz./gal. This compares with about the same quantity of metal used in the sulfate bath, and is only about 60 per cent of the metal content of the cvanide solution and about 25 per cent of the amount present in the fluoborate bath. Throwing power is reported excellent, deposit is good, and the cathode efficiency is about 90 per cent against a 40-50 per cent efficiency for

TABLE 1
Composition of Three Nickel Sulfamate Baths

Constituents	Barret Solution	Bath No. 1	Bath No. 2
Nickel sulfamate	40	40	40
Nickel chloride	-	4	4
Anti-pit agent	0.05	-	
Buffer	0.25		-
Boric acid	3	4	4
Addition agent	-	-	1

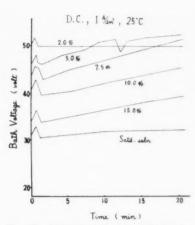


Fig. 183. Change in bath with anodizing time in various concentrations of sulfamic acid, d.c., 1 amp./dm.², 25°C.

the cyanide, 30-70 per cent for the sulfate, and 40-45 per cent for the fluoborate bath. A high current density (which is not critical) can be used. D. Gray gave the following composition: indium sulfamate, 105.36 gm./l.; sodium sulfamate, 150 gm./l.; sulfamic acid, 26.4 gm./l.; sodium chloride, 45.84 gm./l.; dextrose, 2.29 gm./l.; triethanolamine, 2.29 gm./l.; pH under 3.5. Indium anodes are used.

Indium is useful because it may be diffused into a number of basis metals, forming surface alloy layers. It may be diffused into copper, brass, or bronze, thus providing a relatively non-tarnishing surface for decorative purpose, which is easily buffed to a high luster. A lead-indium coating on silver bearings gives a most satisfactory diffusion alloy for aircraft engines.

Anodizing

Tajima reported on a study relating to anodizing with sulfamic acid by the following methods: direct current (dc): alternating current (ac); and superimposition of ac on dc. Favorable results were obtained by the dc method, the film exhibiting good abrasion and corrosion resistance. Optimum anodizing conditions were as follows: current density 1.0 amp./dm.² for a 7.5 per cent (by weight) sulfamic acid bath at a temperature of 25°C.

The changes in bath voltage with anodizing time for different concentrations of sulfamic acid are indicated in Fig. 183. The sharp increase in voltage in 30 to 50 seconds, followed by a rapid drop, then a gradual increase, is considered to be caused by the decrease in resistance at a certain point. The steep increase indicates the

area where the dense film had been formed.

The low concentration baths (2 and 5 per cent) yield oxide films possessing inferior properties and low efficiency. The thickness of the film from the 2 per cent solution was only 1.7 microns indicating that, for low concentration baths, anodic dissolution and oxidation occur at the same time. Absorption of dye, as with abrasion resistance, was found to be best for films produced in the 7.5 per cent solution.

Steam sealing reduced abrasion resistance of the anodized film but increased corrosion resistance appreciably. Steam sealing was carried out in an autoclave at 5Kg/cm.² steam pressure for 35 minutes. A summary of the effect of steam sealing at different bath temperatures is shown in Table 2.

TABLE 2

Bath Temperature °C:	12	25	35	43	54
Ratio of corrosion re- sistance after sealing :film as-anodized	3.4	3.0	9.2	12.5	11.4
Ratio of abrasion re- sistance after sealing :film as-anodized	1.03	0.96	0.97	0.82	0.36

A comparison of changes in bath voltage of the sulfamic acid bath with those of the sulfuric acid and oxalic acid anodizing processes is shown in Fig. 184. The degree of increase in voltage after 60 minutes anodizing time was greatest for the sulfamic acid

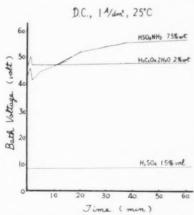


Fig. 184. Comparison of bath voltages of sulfuric, oxalic and sulfamic acid anodizing, d.c., 1 amp./dm.², 25°C.

bath (15 volts). Tajima considered this as evidence of the formation of a denser and more compact film in the sulfamic acid bath. The thickness of the sulfamic acid film was within 82 to 96 per cent of theoretical thickness.



low-temperature black oxide finish for stainless steels

NOW USED IN MISSILE PROGRAM

Du-Lite 3-0 is being used on parts for the U. S. Armed Forces and in the Missile program.

Unusually Versatile

Du-Lite 3-0 can be used on: Stainless Steels, Cast and Malleable Iron. Nickel Alloys such as: Invars, Monels, Niresist, etc.

Remarkable Low Heat

3-0 blackening bath operates at 240°F or less.

No Dimensional Change

Low-temperature 3-0 provides maximum activation necessary for coloring stainless steels without surface damage, or dimensional change often caused by other processes which require excessive heat. This is particularly advantageous in finishing small parts. Delicate optical parts, for example, have been treated successfully while maintaining dimensional accuracy to four decimals. Costly spoilage of finished parts is eliminated.

Economical—Time-Saving

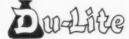
No special equipment is needed. Only replacement of normal dragout is required.

Easy—Safe To Use

No carboys, special handling or safety precautions necessary. Cold water used for final rinse.

Guaranteed

Du-Lite 3-0 is guaranteed by Du-Lite . . . metal finishing specialists.



CHEMICAL CORPORATION 6 River Rd., Middletown, Conn.

Rush da	ta on Du-Lite	3-0 to:
NAME		
COMPANY		
STREET		

SHOP PROBLEMS

BARREL FINISHING — POLISHING AND BUFFING CLEANING — ANODIZING — ELECTROPLATING RUSTPROOFING — LACQUERING AND ENAMELING



METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Tarnishing of Copper Plate

Question: We copper plate steel stampings and have severe staining and discoloring of the copper when the parts sit in our shop overnight. Is there some dip for the parts after they are plated to prevent them from discoloring say for three or four days until they are out of our shop and away from the humidity here?

V.R.

Answer: Tarnishing and staining of copper can be minimized by dipping the articles in a final rinse containing about 2 oz./gal. chromic acid. There are also a number of proprietary conversion coatings which give excellent results. A list of suppliers will be found on page 696 of the 1959 edition of the METAL FINISHING GUIDEBOOK.

Blackening Silver

Question: How can I blacken sterling silver? Is there a dye I can use? I don't care for oxidation; I just want to blacken one side of a disc. Please advise.

ES

Answer: There is no dye which can be applied to sterling silver. A black on one side of the disc can be produced by application of a black paint pigment, such as "drop black in oil," after lacquering. The paint is then wiped from the highlights.

Another method which is commonly used on selected areas is to apply a solution of tellurium chloride, followed by "relieving" with pumice and a scratch brush, greaseless compound, or by buffing. The solution is prepared by dissolving 1 oz. of tellurium dioxide in 4 oz. of muriatic acid and 4 oz. water. It is applied with a brush, either hot or to a heated piece of silver. Proprie-

tary materials of this type are available from most jewelers' supply and plating supply houses.

Exhaust for Hydrofluoric Dip

Question: We have a hydrofluoric acid pickle tank two feet wide by seven feet long which is kept covered except when loading and unloading. What type of hood and what material in the hood is recommended for exhausting the fumes during this loading and unloading, approximately 15 or 20 minutes twice a day.

H. C. W.

Answer: On page 31 of the 1959 edition of the METAL FINISHING GUIDE-BOOK you will find material on exhaust hood design and you can choose the type most suitable for your method of loading and unloading.

For hydrofluoric acid, we would strongly recommend plastic as a material of construction. This type of construction, in addition to being resistant to the fumes, will require no maintenance.

Standard Hardware Finishes

Question: We have a finishing problem which we hope you will be able to help us with. We have a production job of building hardware which has to be finished in a US10B finish, which is an oxidized finish on brass and bronze metal with a final oil rub.

This hardware is made of brass drop forgings, and also bronze tubes and castings which have been polished and finished to a satin finish ready for the US10B finish. These different metals have to be finished so they will be a reasonably close match.

R. S. C.

Answer: Standard hardware finishes from different sources must compare

reasonably when they are viewed at arms length and about 2 feet apart. Samples of Finish US10B are on file at the National Bureau of Standards in Washington, D. C., for reference. Approved duplicate samples are obtainable from the Bureau only in full sets upon payment of charges.

Blistering on Nickel-Silver

Question: We are having trouble with blistering of copper and silver plate on old holloware pieces made of nickel silver. Is there any special treatment that should be used other than cleaners and acid dips prior to plating? We have tried both mild and strong cleaners and acid dips but with little success.

H. E. S.

Answer: Because of the nickel content, the surface tends to become passive and poor adhesion of the subsequent plate results.

Good adhesion is usually obtained if, after cleaning and acid dipping, the parts are given a strike in a solution of 2 lbs. nickel chloride and 1 pint muriatic acid per gallon. Parts are struck for about ½ minute, at room temperature and 6 volts, using carbon or nickel anodes, then rinsed and plated as usual.

Hard Chromium Plating

Question: I am having some trouble with hard chrome plating. We have an automatic control switch to cut the current off at night, after I leave the shop. After the switch cuts off, the part remains in the tank till morning. It etches the chrome so that it will not clean up after grinding it down. I can only think of some electrolytic action in the solution. I was wondering if you could advise me how to keep this etching from taking place.

E. W. M.

Answer: In order to prevent electrolytic action in the bath, it is suggested that, instead of shutting off the current completely, the voltage should be dropped to about 2 volts. This can be done by automatically cutting in additional resistance in the field control, if you are using a motor generator set. All that is required is to insert the required resistance in parallel with the field control and disconnect the latter with the automatic switch, which need not be of large capacity.

If a rectifier is employed as a current source, a motor driven voltage controller may be obtained from the manufacturer, so that the voltage can be reduced at the desired time.

Coloring Anodized Aluminum

Question: We have a problem getting our gold anodized aluminum all the same shade. We maintain a laboratory for control on all our solutions, time, temperature, concentration, pH, alloys, current density, etc. In spite of all this we still have difficulty maintaining a constant in gold.

Is there an instrument that would measure color intensity, thereby accurately telling when to take the work out of the dve?

E. H.

Answer: We know of no instrument which will tell when to take the work out of the dye solution. However, there are instruments available for matching shades. The address of a supplier is en-

Two factors which have an influence on the color, and of which some finishers are not aware, are the crystal structure of the aluminum and stratification of the dve solution. We would suggest that you investigate these factors and also the amount of agitation in the anodizing bath.

Testing Ultrasonic Cleaners

Question: We recently purchased an ultrasonic generator and tank to remove packed dirt from our deeply recessed parts, and find that our results vary with different detergents and at different times. Is there any way we can check the effectiveness of these detergents in our unit?

L. P. D.

Answer: A simple method of comparing the effectiveness of cleaners in ultrasonic tanks is to use a small piece of frosted glass on which a mark has been made with a lead pencil, timing the period required for complete removal. The lead pencil mark can also be placed between two sheets of frosted glass to simulate extreme conditions of soiling. The test is not precise, and measures only the effect on insoluble soils, but is convenient for determining

the ultrasonic intensity in different areas of the tank or for checking transducer arrangements, variation in which may be the cause of the dissimilar results being experienced at different times. Of course, the best test method is to employ samples of the parts to be cleaned in production.

Professional Directory

CHEMICAL CONSULTANT

N. L. KOSLIN, PH.D. SPECIALIZING IN METAL FINISHING

Water and Waste Disposal Problems Air Force Certification Tests — Salt Spi Trouble Shooting

2641 Cleveland Ave., Columbus 11, Ohio

SCIENTIFIC CONTROL LABORATORIES

Finishing Consultants-Registered Engineers Salt Spray—Thickness Testing—Analyses
PLANNING—RESEARCH—DEVELOPMENT CLiffside 4-2406

3136 S. Kolin Avenue, Chicago 23, III.

HENRY LEVINE & SON, Inc. Metal Finishing Consultants

Analysis of all electroplating solutions Engineering of finishing installations Air Force Certification Tests Salt Spray Thickness and Adhesion Tests 153 East 26th St., New York, N. Y. MUrray Hill 5-9427

WILLIAM E. DECKER CONSULTING CHEMIST

P.O. Box 383 Plainfield, N. J. Tel. PL 6-0257

Specialist in Pearlescent Pigments

WILLIAM E. GRAUL

CONSULTING ENGINEER Survey - Design - Supervision Specialists in Plating Room Installation Engineering

P. O. Box 66 Lansdowne, Pa. MAdison 3-7947

CROBAUGH LABORATORIES

TESTING - RESEARCH - ENGINEERING Chemical - Metallurgical - X-Ray Spectrographic - Organic Metal Finishing Problems Air Farce Certification Tests THE FRANK L. CROBAUGH CO. 3800 Perkins Cleveland 14, Ohio

TOMORROW'S PRODUCTS TESTED TODAY

A service to aid industry in producing longer-lasting and better-looking products. Quick predetermination of durability and perma-nency by actual exposure test in South Flor-ida. Write us today for full information.

SOUTH FLORIDA TEST SERVICE, INC. EST. 1931 4301 N. W. 7th St. Miami 44, F

Miami 44. Fla.

GRAHAM, SAVAGE & ASSOCIATES, INC.

CONSULTING - ENGINEERING RESEARCH Electroplating and Metal Processing
Waste Treatment and Production Problems SURVEYS - DESIGNS - SPECIFICATIONS 475 York Rd.

1724 Clinton St.

Jenkintown, Pa. Kalamazoo, Mich.

G. B. HOGABOOM JR. & CO. Consulting Chemical Engineers

Metal Finishing — Electrodeposition — Solu-tion analyses, AIR FORCE CERTIFICATION tion analyses. AIR FORCE CERTIFI TESTS — Salt spray, thickness of

44 East Kinney St. MArket 3,0055

Newark 2, N. J.

THE AMACHEM LABORATORIES

TESTING ANALYSES ENGINEERING For Metal Finishers
Plating solution analyses and control. Testing of deposit-thickness, composition porosity, tensile strength. Salt Spray tests.

AIR FORCE CERTIFICATION TESTS 1724 West 58th St., Los Angeles 62, Calif. AXminster 4-1262

ERNEST J. HINTERLEITNER

5117 Crenshaw Boulevard LOS ANGELES 43, CALIFORNIA AXminster 4-1531

research - engineering - consulting since 1926 . . . U.S.A. and Foreign

CONSULTANT ON ORGANIC FINISHING

J. ARTHUR WEED

2233 DERMOND AVENUE DREXEL HILL, PENNSYLVANIA Phone, Sunset 9-7066 20 years of Practical Experience

LATER TECHNICAL SERVICE Inc

ELECTROPLATING AND CHEMICAL ENGINEERS

Air Force certification tests Salt Spray, thickness and adhesion tests Spectographic analysis Solution, Metal and Salt analysis

Plant Design and Engineering Plant layout and construction

Industrial waste and water supply treatment

NEW YORK LABORATORY CHICAGO LABORATORY

59 East 4 St., New York 3 ALgonquin 4-7940 509 S. Wabash Ave., Chicago 5 HArrison 7-7648



Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD

PRINTED COPIES OF PATENTS are furnished by the Patent Office at 25 cents each. Address orders to the Commissioner of Patents, Washington 25, D. C.

Flexible Abrasive Wheel

U. S. Patent 2,842,902. July 15, 1958. T. J. Miller and E. L. Gothier, assignors to Minnesota Mining and Mfg. Co.

An abrasive wheel structure comprising an annulus of many juxtaposed radially extending flap sections of abrasive sheet material, said sections being uniformly distributed about the central axis of said annulus and being in densely packed relationship at the inner peripheral portion of the latter with adjacent sections being rigidified and firmly rigidly adhesively bonded together over an inner end area extending radially outwardly from the inner ends of said sections at least about 1/4 inch across the entire width thereof to form a rigidly reinforced inner rim in said annulus.

Etch Primer and Top Coat

U. S. Patent 2.843,503. July 15, 1958. M. Salo and G. J. Clarke, assignors to Fastman Kodak Co.

A process for providing a corrosionresistant coating for steel in which at least three successive coatings are applied comprising coating with a primer comprising about 9% cellulose acetate butyrate. 8.6% zinc tetroxychromate, and a solvent mixture consisting of toluene, methyl cellosolve and ethyl alcohol, applying a second coating comprising 60-95'; cellulose acetate butyrate, 5-40% methylol phenyl allyl ether, about 0.3% phosphoric acid, solids basis, and a solvent mixture consisting of oxylene, toluene, butyl alcohol, isopropyl alcohol and butyl acetate, and a third coating comprising 9.1% cel-Julose acetate butyrate and a solvent mixture consisting of xylene, toluene, butyl alcohol, isopropyl alcohol and butyl acetate.

Gas Plating

U. S. Patent 2,843,506. July 15, 1958. F.E. Drummond, assignor to The Commonwealth Engineering Co. of Ohio.

A process of gas plating an article

with light metal utilizing scrap light metal as a starting material, said process comprising the steps of admixing said scrap light metal with mercury and heating the mixture to form an amalgam of the light metal, continuing the heating of said amalgam at a higher temperature and under non-oxidizing atmospheric conditions to volatilize the mercury leaving a porous mass of substantially pure light metal while retained in said atmosphere, thereafter reacting the resultant porous metal under said non-oxidizing atmospheric conditions with a reactant to form a heat-decomposable compound of the light metal, and contacting the article to be plated with said heat-decomposable light metal compound while heated to a temperature sufficient to decompose said light metal compound and cause deposition of the light metal onto the surface of the article.

Aluminum Pigmented Coating

U. S. Patent 2,843,554. July 15, 1958. C. G. Murphy, assignor to E. I. du Pont de Nemours & Co.

A ready-mixed aluminized liquid coating composition characterized by package stability during lengthy storage and retention of leafing value during said storage, comprising an oleoresinous esterified polyether resin, fine particle size leafing-type aluminum pigment in the proportion of 30 to 100 parts for each 100 parts of said esterified polyether resin, and a volatile hydrocarbon solvent for said esterified polyether resin.

Silicone Resin Ceramic Paint

U. S. Patent 2,843,559. July 15, 1958. M. Kornbluth, assignor to the United States of America.

A high-temperature resistant enameling paint for producing a vitreous enamel anti-corrosion coating on ferrous metal shapes at elevated temperatures, which comprises a vehicle consisting essentially of a silicone polymer varnish for providing a high heat-resisting binder film, and a refractory frit as a pigment base for the paint, the said frit being an aggregate of a plurality of frits having step-wise increasing melting points between approximately 1050° F. and approximately 1600° F. to provide when fused a vitreous enamel coating for the ferrous shape to be protected.

Tumbling Barrel

U. S. Patent 2,843,979. July 22, 1958. J. Lupo.

A tumbling barrel for tumbling articles in an abrasive material, said barrel including a shell having end walls and a peripheral wall, said end walls having means for rotatably supporting the barrel and said peripheral wall being provided with a pair of diametrically opposed openings extending longitudinally thereof between the end walls, a removable closure member for each of said openings, a foraminous panel providing a screen insertable into the barrel through one of said openings so as to subdivide the interior of the shell substantially medially thereof into oppositely disposed compartments each extending longitudinally of the shell, and means on the interior of the shell slidably removably mounting the panel in the shell with one edge of the panel closely adjacent and parallel to one longitudinal side edge of one of the openings and the opposite edge of the panel closely adjacent and parallel to the diametrically opposed longitudinal side edge of the other opening and with the plane of the panel inclined at an acute angle to the plane which is equidistant from the longitudinal side edges of both of the openings.

Flexible Abrasive Wheel

U. S. Patent 2,843,980. July 22, 1958. R. W. Bernstein and A. Block, assignors to Merit Products, Inc.

A replaceable abrasive unit for cylindrical hub structures having axial slots and retaining means, comprising: an anchor plate; a stack of flexible sheet members, said stack being divided at one margin to straddle said anchor plate, said sheets having limited compressibility in a direction transverse to said stack; and a plurality of staples extending transversely through said stack and anchor plate, each staple securing said sheets in a compressed condition to lock said sheets in said stack and to said anchor plate; said anchor plate protruding from said stack to fit

a slot of said hub structure and having means for engagement by said retaining means.

Abrasive Drum

U. S. Patent 2,843,981. July 22, 1958. A. Block, assignor to Merit Products, Inc.

An abrasive drum, comprising: a drum structure including end plates and a plurality of storage tubes extending axially between said end plates and spaced equally from a common center: a tubular spindle in each storage tube; each storage tube, its spindle, and at least one of said end plates having axial slits adapted to register; abrasive sheets, each having a retainer element along one margin adapted to be slipped endwise into a spindle as the adjacent margin of said sheet is slipped endwise into the corresponding storage tube: and means for rotating said spindles to wrap said abrasive sheets there-

Apparatus for Galvanizing Pipe

U. S. Patent 2,844,122. July 22, 1958. A. F. Kritscher, assignor to U. S. Steel Corp.

A pipe-galvanizing apparatus including a tank having inclined entry and exit conveyors side by side at one end thereof.

Brush Holder and Filter

U. S. Patent 2,844,256. July 22, 1958. F. A. Campbell.

A paint brush holder for attachment to a receptacle having an open end, said holder comprising a bracket clampingly mounted over the open end of the receptacle, an annular member disposed within the receptacle and vertically slidably mounted on the bracket. means for locking said annular member in adjusted position on said bracket, a cylindrical member slidably mounted within said annular member, spring means urging said cylindrical member upwardly away from paint in the receptacle, a screen member closing the bottom of said cylindrical member for straining paint as it enters the cylindrical member during depression thereof whereby the screen member will limit the movement of a paint brush into the paint.

Conversion Coating Aluminum

U. S. Patent 2,844,496. July 22, 1958. J. L. Newell and E. A. Walen.

A composition of matter for use in

providing corrosion resistant films on aluminum and alloys thereof consisting essentially of, in 100 parts, about 5 to 72 parts by weight of sulfamic acid; about 1 to 16 parts by weight of an alkali metal fluoride; about .3 to 34 parts by weight of an alkali metal nitrate, and about 11 to 80 parts by weight of a compound chosen from the group consisting of chromic acid, alkali metal chromates and alkali metal dichromates.

Barrel Plating

U. S. Patent 2,844,528. July 22, 1958. A. R. Hoffman.

An electroplating system for a movable article comprising a metallic plating tank for containing electrolyte, a rotatable barrel composed of electrically insulating material adapted to receive an article to be plated and to be lowered into the tank and supported therein, and a control device for closing time switch contacts after the barrel is immersed in the electrolyte, whereby the current flow commences only after the article-containing barrel has been immersed and terminates after a predetermined time selected as sufficient for the desired thickness of coating upon the article in the barrel.

Black Nickel Plating

U. S. Patent 2,844,530. July 22, 1958. W. A. Wesley and B. B. Knapp, assignors to The International Nickel Co., Inc.

A process for electrodepositing attractive black finishes on metallic articles which comprises subjecting the article to be blackened to the action of an aqueous electroplating solution having a pH within a range of at least as low as about 2.3 and up to about 5.5 and containing from 7.5 g. p. l. to about 45 g. p. l. of ammonium chloride, about 7.5 g. p. l. to about 30 g. p. l. of sodium thiocyanate, from 15 g. p. l. to about 60 g. p. l. of zinc chloride, and nickel chloride hexahydrate, the nickel chloride hexahydrate concentration and current density being related such that the correlation falls within the shaded area ABCDA of the accompanying graph.

Continuous Anodizing

U. S. Patent 2,844,529. July 22, 1958. A. Cybriwsky and N. Mostovych, assignors to Reynolds Metals Co.

A method of anodizing a surface of

an anode composed of aluminum which comprises: introducing said anode into an acidic electrolytic anodizing liquid bath in a manner maintaining a predetermined surface area of said anode in active contact with said bath; passing an electric current from said anode through the bath at a predetermined rate to maintain a high anodizing current density over said active surface area; conditioning the bath to maintain its temperature below a value at which substantial dissolution of aluminum from said active surface area occurs; and maintaining a temperature differential of at least 10° F. between said anode and said bath by continuously engaging another surface of said anode in heat exchange relationship with a conditioning surface while said predetermined anode surface is subjected to said anodizing current.

Ultrasonic Cleaning Apparatus

U. S. Patent 2,845,077. July 29, 1958. N. G. Branson, assignor to Branson Instruments, Inc.

Ultrasonic cleaning apparatus comprising focused compressional wave generating means for setting up compressional wave energy in a surrounding medium directed toward a distant focal point, an enclosure for containing both a cleaning liquid and an object to be cleaned and liquid confining means.

Phosphating

U. S. Patent 2.845.376. July 29, 1958, M. Hyams, assignor to Neilson Chemical Co.

Process of providing upon the surface of metal an adherent coating of insoluble metal phosphate which comprises applying a phosphatizing liquid to a metal surface to form a film thereon, and subsequently, while said film is still in the liquid state, applying steam to said film to complete the phosphate coating action.

Extension Handle for Paint Rollers

U. S. Patent 2.845.647, Aug. 5, 1958. W. J. Schemers

An extension handle for a paint roller.

Paint Feed Tank

U. S. Patent 2.846,123, Aug. 5, 1958. R. J. Gray, assignor to Gray Co., Inc.

Liquid-handling apparatus for delivering liquid from an original open container to a remote liquid dispenser, said apparatus comprising a lid to be placed over the original container of liquid and a rotary gear-pump and rotary agitator disposed beneath said pump, both pump and agitator carried by and supported beneath said lid and operatively extending into the liquid, and a single motor operatively connected to both said pump and said agitator.

Paint Mixing Device

U. S. Patent 2,846,201. Aug. 5, 1958. M. Mermelstein

A paint mixing device, comprising a frame, a socket adapted to receive a container of paint material to be mixed, means connected to said socket adapted to removably secure said container to said socket, flexible means connecting said socket to said frame at two points, and a motor mounted on said frame.

Pickling-Coating Bath

U. S. Patent 2,846,341. Aug. 5, 1958. W. C. Johns and W. J. Wojtowicz, assignors to The H. A. Montgomery Co.

In the treatment of ferrous metal to pickle and coat the same, the step of immersing the metal in a heated pickling bath comprising an aqueous solution of from about 5% to about 15% by weight of pickling mineral acid selected from the class consisting of sulfuric and hydrochloric acids and mixtures thereof, from about 2% by weight up to the limit of its solubility of oxalic acid, and at least 0.5% by weight of soluble ferric iron salt, and continuing the immersion until the desired degree of pickling and coating have occurred.

Acid Tin Brightener

U. S. Patent 2,486,381. Aug. 5, 1958. W. Frick, A. Geldbach, J. Korpium and F. Sedlacek, assignors to Dr. Ing. Max Schlotter

In the electrolytic deposition of tin as a smooth layer, the step comprising depositing said tin from an acid tin electrolyte which contains a flavonol compound in an amount sufficient to cause deposition of a smooth tin layer and improvement of the throwing power of the electrolyte on operation at low voltages with high current densities.

Conversion Coating Process

U. S. Patent 2,846,342. Aug. 5, 1958. L. P. Curtin.

Process for producing an adherent

bonding coat on aluminum, zinc and ferrous metal surfaces which comprises the following sequence of steps: (1) freeing the metal surface from water-breaks, (2) wetting the metal surface with a solution containing chromate selected from the class which consists of chromic acid and ammonium dichromate, the solution also containing a hypophosphite reducing agent for said chromate selected from the class which consists of free hypophosphorous acid and calcium, magnesium and zinc hypophosphites and (3) destroying substantially completely oxidants and reducing substances present in the film of said chromate solution adhering to the metal surface by heating to a temperature above 100° C., the residue remaining on the metal surface constituting an adherent, chromic hydroxide-phosphate bonding coat.

Chemical Coating for Aluminum

U. S. Patent 2,846,343. Aug. 5, 1958. W. A. Mason

A method for effecting a cold chemical oxidation of aluminum and its alloys comprising coating the metallic surface with cupric chloride, ferric chloride, and a copper blackening agent selected from the group consisting of selenium and tellurium in an acidic solution comprising water and an alcohol selected from the group consisting of isopropyl alcohol and methanol to effect a union between the aluminum surface and blackened copper for producing aluminum having a surface with a black color.

Plating Piston Rings

U. S. Patent 2,846,379. Aug. 5, 1958. C. G. Chambers and R. A. Spaulding, assignors to General Motors Corp.

A process for use in making split resilient piston rings having gaps between the peripheral ends thereof.

Chromium Bath Spray Depressant

U. S. Patent 2,846,380. Aug. 5, 1958. H. Brown, assignor to The Udylite Research Corp.

A compound having the formula $R_{\rm F}MSO_3X$, where $R_{\rm F}$ represents a saturated fluorocarbon chain of 3 to 12 carbon atoms, M is a carbon linkage group containing from 1 to 4 carbon atoms and positioned between the $R_{\rm F}$ group and the sulfur of the sulfonic group, the carbon atoms in said linkage group carrying at least one element

selected from the group consisting of hydrogen, oxygen and nitrogen and X is a cation, said compound containing in the $R_{\rm F}$ substituent a number of atoms selected from the group consisting of chlorine and bromine which number is minor relative to the number of fluorine atoms present in said $R_{\rm F}$ substituent said compound being added in sufficient amount to substantially decrease formation of spray and mist.

Volumetric Paint Mixer

U. S. Patent 2,845,714. Aug. 5, 1958. L. L. Marsh, assignor to Marien-Metal Products Co.

A device for proportioning standard color ingredients for producing a predetermined quantity and color of mixed paint.

Zinc Thickness Tester

U. S. Patent 2,846,589. Aug. 5, 1958.
F. E. Pellissier and E. E. Wicker, assignors to U. S. Steel Corp.

Apparatus for determining the thickness of a zinc coating or a ferrous metal base comprising an X-ray tube arranged to direct a primary X-ray beam into the base material, the surface of said base material making an angle of at least approximately 70° with the X-ray beam, a radiation detector arranged on the same side of the ferrous metal base as the X-ray tube for detecting fluorescent radiation from the ferrous metal base, the surface of said base material making an angle of at least approximately 80° with the axis of said radiation detector, and a filter located between the ferrous metal base and the radiation detector, said filter being approximately between .001 and .003 inch thick and formed of a material of the class consisting of nickel, iron and nickel-iron alloys.

Plating Porous Metals

U. S. Patent 2,846,759. Aug. 12, 1958.
R. T. Foley and E. V. Raymond, assignors to General Electric Co.

A corrosion resistant plated porous product comprising a porous metallic formed of pressed bronze powder, said porous metallic base material being impregnated with a liquid consisting essentially of oil having a viscosity between 225 Saybolt seconds at 130° F. and 0.6 centistoke at 78° F. and electroplated with a firmly adherent continuous coating of a metal selected

from the group consisting of tin, zinc, cadmium, copper and silver and an alloy of tin and zinc.

Organic Coating System

U. S. Patent 2,847,323. Aug. 12, 1958. J. L. Evans and J. A. Pappalardo, assignors to E. I. du Pont de Nemours & Co.

A metal article having a hard, adherent, crack-resistant, multiple-layer coating comprising a layer of primer and a superimposed layer of methyl methacrylate lacquer in adherent contact therewith, said primer being a baked layer of a liquid coating composition comprising pigment, solvent, and, as the principal organic film-forming material, epoxyhydroxy polyether resin esterified with 10-50%, by weight based on said resin, of drying-type fatty oil acid.

ABSTRACTS

Chromic Acid Dips for Copper and Brass

By M. Straschill: Metallwarenind. und Galvanotechnik, 49, No. 1, 20

Chromic acid has practically the same oxidizing action as nitric acid with the great advantage that no toxic or unpleasant fumes are given off. On brass, a pleasant yellow color is obtained with these baths. The chromic acid baths work more slowly than the nitric acid baths, and do not always give quite the same surface effect. They have the great advantage that the metal is attacked less, the baths do not heat up so much in use, which gives a better control over the operation. A certain corrosion-protective action is given to the ware. Chromic acid baths work at 15-70°C. The chromic acid can be added to the bath either as the free acid or as salts (dichromates). Sodium dichromate is best used in conjunction with mineral acids.

A bright dip for copper or brass is obtained with a bath containing 5% sulfuric acid and 3% potassium or sodium dichromate. Another formulation is given as 200 g. potassium or sodium dichromate, 800 g. (435 cc.) conc. sulfuric acid, 1 liter water. The working temperature of this bath is about 60°C. The dip time is a few seconds. In general, the hot baths give

more brilliant surfaces in a shorter time.

Oscillograph Method for Testing Aluminum Oxide Coatings

By G. Hahn: Metalloberflaeche, 12, No. 6, 170.

Determination of the thickness of anodized coatings, by microscopic examination of sections or stripping of the oxide coating, either destroys the basis metal or the oxide film. The electrical method, testing by means of filmrupture, is also a destructive test. The author employed an electron oscillograph test method, which is non-destructive. This method permits conducting non-destructive control on the closure (sealing) of anodized oxide films; the method was developed particularly as a control for electrical insulation production.

The oscillographic test method can also be used as a control for the hardness testing of oxide coatings. Coating thicknesses to a lower limit of 0.2 microns can be determined.

Oxide-Phosphate Coatings for Corrosion Protection of Iron and Zine

W. Roggendorf: Industrie-Anzeiger (Germany), 78, 191.

Artificially produced oxide and phosphate coatings on steel have now been in use for a considerable time. The new process is based on the production of combined oxide-phosphate coatings. The coatings consist of metal phosphates and iron oxides. No crystal formation can be established by microscopic examination. The coating is formed up to some microns in thickness and improves the corrosion resistance of the steel. The color tone of this protective coating lies between black and light gray and varies somewhat, according to the basis material.

Cleaning of Formed Sheet Parts by Ultrasonics

E. Tschanter: Blech (Germany), 4, No. 2, 29.

Cleaning methods which have been employed up to now for metal finishing, using mechanical or chemical procedures, have their limitations. The actual cleaning process consists of various individual procedures and the best effect is obtained only under certain conditions. Ultrasonic cleaning often offers the possibility of an increased degree of cleansing by virtue of the relatively high velocity setup between the parts being cleaned and the cleaning fluid. This is because the cleaning fluid is set into high frequency mechanical vibrations (20 kilocycles or more) by ultrasonic resonance heads. Strong surfaces are brought into being through this and, because of the alternating action, the dirt particles are In place of a coarse mechanical scouring, a fine scouring action is achieved with ultrasonic cleaning, with very small space requirements and a great depth of action. The high accelerations obtained (over 100,000 grams) act also on recessed pockets and

Investigations conducted on dirty parts and followed by means of radio-active isotopes have shown that, with normal cleaning methods, about 14 to 35% of the dirt is removed, with hand brushing about 92%, and with ultrasonic cleaning, 99.5%, and in a considerably shorter time.

The magnetostrictive vibrators are particularly important for the cleaning of sheet parts; the ultrasonic-nozzle vibrator heads on the other hand are used for vibrating larger volumes of cleaning fluid. The choice of the ultrasonic generator is made according to the parts to be treated and a broad classification can be made as follows:

	Frequency Rang
Ultrasonic Vibrator	kilocycles
Ultrasonic Nozzle	. 0.5 to 60.
Magnetostrictive Trans- ducer	10 - 100
Barium Titanate Trans- ducer	100 - 500
Piezo quartz crystal	500 - 10.000

Notes

Requires 8 kg./sq.cm. and 60 1/min. Cleaning of large sheets is possible. Degree of efficiency falls with rising frequency and, at 100 kc. is below 0.3. Used for larger parts.

Easily shaped, low stresses. Has low efficiency and is sensitive to temperature. Loading densities of up to 4 w. sq.cm.

Lower frequency limit is about 300 kc. Used for smaller parts.

Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT FOR THE METAL FINISHING INDUSTRIES



Corrosion-Test Cabinets

G. S. Equip. Co., Dept. MF, 15583 Brookpark Rd., Cleveland 35, Ohio.



Answering the need for extra capacity, high-accuracy test cabinets for bulky specimens, assemblies, and quantity (batch-type) testing, with all atmospheres, is the new line of "King-Size" Accelerated Corrosion Test Cabinets, which meet A.S.T.M, and U.S. Government specifications for such equipment. Operating currents are 110V or 220V/single phase/3.5 KW. (optional), 220V, 440V, or 660V/3 phase/with 110 control. Test chamber of model shown, 96" x 48" x 48" deep I.D., permits testing of such large items as auto bumpers, steering assemblies, and complete engines intact without cutting apart or dismantling into sections requiring separate tests.

The new, big cabinets are either stainless or mild steel, all-welded, epoxy lined, and uniformly heated throughout by full-coverage water jackets on all four sides and bottom (cabinet within a cabinet). Eliminated are all dangers of "hot bottom" and secondary galvanic acceleration of corrosion. They feature higher test-heats (up to 150°F). All temperatures are held to $\pm 1/2$ °F. Controls are located at one end for convenience. The test chamber free of all metal parts or other contaminating materials.

H-T Plexiglas window, 23" x 17", in lid is important visual aid factor for observing tests in progress without opening cabinet, interrupting process, or disturbing specimens. Counterweighted opening device permits lid to be opened and closed without effort,

and remain at any open position desired. Pneumatic lifting mechanism is optional at extra cost.

Also featured are removable salt reservoir and cover for all types of environmental testing: salt, Corrodkote, acetic acid, and humidity. Other important "optionals" are automatic bubble tower liquid level control with strainer, complete air compressor equipment, and full kit of cabinet exhaust accessories.

Ultrasonic Degreaser

Detrex Chemical Industries, Inc., Dept. MF, Box 501, Detroit 32, Mich.

A new model Econo-Sonic unit is a complete cleaning, distillation and filtration system in itself. Priced at only



\$1750, this new ultrasonic unit precleans, ultrasonic cleans and pressurespray-rinses. It is ideally suited for the use of manufacturers of small precision parts.

It is compact in design, measuring only 38½" wide, 17½" deep and 28¼" high, yet provides all facilities needed to give the finest in production cleaning in its work-size capacity.

Printed Circuit Plating and Etching Resist

Screen Process Lab., Dept. MF, 5-33 48th Ave., Long Island City 1, N. Y.

A new plating and etching resist has been developed for the production of printed circuits. The resist prints easily, and very sharply, with a minimum of drag. It will resist the usual platers cleaning solutions; plating baths, such as acid copper, bright nickel, solder, rhodium, silver and gold; and etchants, such as ferric chloride and 20%

chromic acid. It can be easily and completely removed from the copper laminate, in a perchlorethylene, trichlorethylene, or carbon tetrachloride vapor degreasing system, or with mineral spirits. It will force dry in about 15 minutes at 150°F., and air dry in about an hour. It is extremely dimensionally stable, is not affected by humidity or other atmospheric conditions, and will not break down through the evaporation of solvents, it is claimed. No strong solvents are necessary to clean screens, as they can be cleaned with ordinary mineral spirits. The resist is non-toxic, and almost odorless. Although it may be thinned with mineral spirits, it is recommended that it be used at package consistency.

Free quart samples are available on request.

Titanium Anode Hook

Plating Products, Inc., Dept. MF, 1511 N. Washington St., Kokomo, Ind.

A new titanium metal anode hook is claimed to be almost indestructible when used with nickel, chromium, or acid copper plating solutions. These advantages are also claimed: 1. No chemical or electrochemical attack on hooks by plating solution. 2. No foreign metal to contaminate solution from

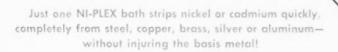


hooks. 3. Hooks can be placed completely under plating solution level, thus minimizing scrap loss, 4. Hook threads will not decompose in plating solution. 5. No electrolysis on the sur-

NeW!...from H-VW-M

NI-PLEX A FAST, LOW-COST

NICKEL STRIPPING COMPOUND that's EASY on basis metals /



NO CYANIDES, CAUSTICS, ACIDS OR CURRENT... and no noxious fumes! New Ni-Plex won't cause corrosion or pitting... tests prove it's the *only* effective nickel stripper that's safe for parts containing two or more basic metals.

NI-PLEX SAVES YOU MONEY! Ni-Plex stays laboratory-fresh, delivers 100% efficiency in closed tanks, keeps its stability even at high temperatures. Result: Ni-Plex costs average better than 1¢ less than other stripping compounds for every square foot of 0.0001" nickel stripped! What's more, nickel can be reclaimed when Ni-Plex is used.

NO PILE-UP OF REJECTS waiting for a "custom-made" bath! Ni-Plex's *versatility* and *stability* mean you can keep an all-purpose bath standing by, in a clean, covered tank—ready to use as you need it.

EASY TO PREPARE! Just mix with water, following simple instructions. Use Ni-Plex for stripping racks, too!

UNRETOUCHED
PHOTO of wrench
plated with H-VW-M
Nickel-Lume and chrome.
Lower half was stripped
with new NI-PLEX. Note
clean, clear surface of basis
metal—no pitting, no rough
spots. no rounded corners!

DON'T MISS THIS OPPORTU-NITY to discover for yourself how new NI-PLEX can solve your nickel stripping problems. Clip the coupon below, and drop it in the mail, today, along with \$4.00 for a quantity of NI-PLEX sufficient to make a I-gallon bath. Try it—and compare the results! Hanson-Van Winkle-Munning Company, Matawan, New Jersey. Offices in principal cities.

MAIL THIS COUPON TODAY....

HANSON-VAN WINKLE-MUNNING CO.

Matawan, New Jersey Att. J. W. Carton

Please send us parcel post prepaid enough NI-PLEX for a 1-gallon bath, along with complete instructions.

S4.00 Check enclosed

Purchase order enclosed

Company....

Address

Attention of

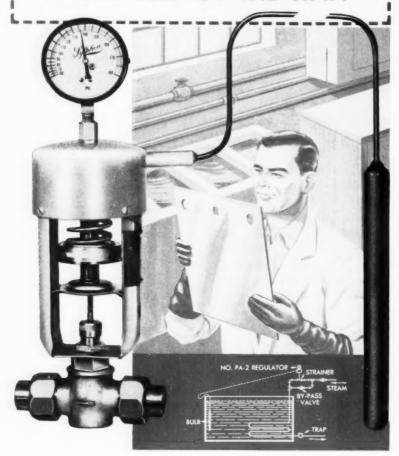


PLATEMANSHIP—Your H-VW-M combination—
of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and
polishing—of a complete equipment,
process and supply line for every need.

⊕ 4546

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES - EQUIPMENT - SUPPLIES

Temperature Under Control EVERY STEP OF THE WAY!



Precise temperature *counts* . . . in cleaning, plating, coating . . . and this Sylphon® PA-2 Temperature Regulator gives positive control at every step. Specifically engineered for metal finishing, with stainless steel frame and valve trim; plastisol-coated bulb resists virtually all corrosive metal finishing chemicals. Sturdily constructed, self-powered; temperature range of 60° F. to your specifications. Large dial for instant readability.

WRITE FOR BULLETIN ET



FULTON SYLPHON DIVISION . Knoxville 1, Tenn.

face of titanium that is exposed to the solution; therefore, will not generate gas or decompose brighteners.

The hooks are made of 3%'' square stock in $3\frac{1}{2}$ " through 8" graduated lengths to fit $1\frac{1}{2}$ " dia. anode rod size or less.

Airless Paint Spray Gun

Spraying Systems Co., Dept. MF, 3245 Randolph St., Bellwood, Ill.



The 22 HPSSTC GunJet heavy duty spray gun for use in hydraulic spray coating and painting at pressures up to 2,000 psi, operates without the use of air, requiring only higher pressures as obtained in airless paint spraying systems.

Orifice tips are interchangeable and are available in an unusually wide choice of capacities, spray angles and materials to meet every known requirement. Choice of tip materials include stainless steel, hardened stainless steel, chrome plated brass and tungsten carbide inserts in chrome plated tip body. The valve seat and mating needle insert are made of tungsten carbide for maximum resistance to abrasion. The stainless steel body and Teflon packings provide maximum resistance to chemical action.

The inlet body assembly is completely independent of the balance of the unit for easier maintenance and better overall operation. A constant pressure trigger spring needs no adjustment and gives comfortable, pre-set trigger action. Convenient trigger lock holds trigger in "on" position for effortless continuous spraying. The gun weighs only 12 ounces and is easy to handle, with full-hand pistol grip and finger tip control. The unit is quality built throughout and is designed for operating pressures from 400 to 2,000 psi.

Fluoride Pickling Compound

Platers Research Corp., Dept. MF, 59 E. Fourth St., New York 3, N. Y.

Fluromine is a dry fluoride containing compound used in the acid treatment of metals. It is considerably less

hazardous to use than liquid hydrofluoric acid, it is claimed.

It can be used in a water solution as a smut remover or in conjunction with nitric acid or sulfuric acid, and improves the pickling of colloidal silicate films, sand castings, activating and bright etching of aluminum and magnesium, stainless steel and titanium.

The product is a free flowing powder, packed in polyethylene-lined nonreturnable fiberboard containers.

Alkyd Enamel

Paint Div., Glidden Co., Dept. MF, Cleveland, Ohio.

A new, all-purpose, alkyd enamel for exterior and interior wood and metal application, called Industrial Speedenamel, is offered in a wide variety of distinctive colors for product finishing and maintenance painting.

The finish is adaptable for brush, spray or dip application and can be air-dried or baked in conventional baking equipment. The resultant finish provides a tough, flexible film with exceptional resistance characteristics.

The product has unusual weathering properties and has outstanding adhesion to metal. It employs an entirely new resin which provides performance characteristics beyond anything previously obtainable in this type of product.

Belt Polishing Head

Hammond Machinery Builders, Inc., Dept. MF, 1601 Douglas Ave., Kalamazoo, Mich.

The UP-2 abrasive belt polishing head makes it possible to polish and buff economically on one machine. Designed for use on the manufacturer's OK, RL and ROL polishing lathes, the





PERM-A-CLOR NA
ttrichlorethylene)
Solvent Degreasers
Ultrasonic Equipment
Industrial Washers
Phosphate Coating Compounds
PAINTBOND Compounds
Rust Proofing Materials
Alkali and Emulsion Cleaners
Alkali and Drawing Compounds
Extrusion and Drawing Commounds
Spray Booth Compounds
Aluminum Treating Commounds

DETREX, pioneer in all phases of metal cleaning and processing, can save you money. Write today for full information.

PERM-A-CLOR is registered trademark of

NETREY

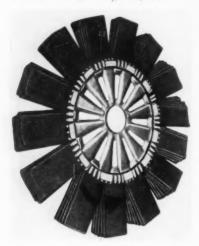
Chemical Industries, Inc.
BOX 501, DEPT. MF-389, DETROIT 32, MICH.

head offers all the advantages of contact wheel, free belt and platen grinding and finishing. It is recommended for light to medium duty polishing operations and can be furnished on either or both sides of the lathe.

The upper idler pulley assembly is adjustable so belts from 52" to 90" in length can be used. Belt width can be from 1 to 2½ inches. Belt guard and dust scoop with exhaust outlet come with the head.

Abrasive Polishing Wheel

American Buff Co., Dept. MF, 2414 S. La Salle St., Chicago 16, Ill.



By installing Uniflex wheels ahead of other buffs on the automatic, a single buffing machine completes every operation without pause. Constructed of flexible, folded layers of abrasive-coated fabric, the individual units of this wheel follow every contour of today's most complex metal forms. Set up ahead of other buffs on the automatic, the new abrasive buffing heads permit uninterrupted finishing from rough part to completed product. A single automatic now grinds, polishes, sisals and color buffs at huge savings.

All wheels are available in 3 types, centerless, throw-away center and reusable center to fit all arbor holes. Ten sizes, ranging from 8" x 3" to 18" x 9" fit every buffing need.

Non-Acid Deruster

Du-Lite Chem. Corp., Dept. MF. Middletown, Conn.

"Striplite," a single dry salt, is a new, non-acid material for removing rust, scale and black oxide from steel, without attacking the basis metal.

The salt is dissolved in water at a

The most efficient, most trouble-free



ratio of from 1 to 4 pounds per gallon and the solution is used at 180°F. to boiling. If necessary, it can also be used electrolytically. Activity of the solution is proportional to its strength, temperature, and the presence or absence of electric current.

A testing bath method has been devised which quickly determines the strength of solution needed to accomplish a particular stripping job. The salt is said to work successfully in extreme cases, even to the removal of heavy black oxide.

For fast work, cyanide can be added to the electrolytic bath, but caution must be observed in the disposal of dangerous fumes. The product can also be used for soak derusting with a nonboiling solution.

Alkaline Paint Stripper Additive

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

Stripper Additive No. 4 is a new additive, designed to enable alkaline paint stripping solutions to remove difficult synthetic finishes. The new product is a solvent, which converts a narrow-range stripping solution into a wide range solution capable of removing epoxy, acrylic, and similar tough finishes.

The use of this additive, according to the manufacturers, makes it possible to salvage rejects economically, and to remove paint build-up from hooks, spray booth filters, and other equipment used in the painting operation.

The new material is added to alka-

paint-supply system ever devised!

Compare for yourself! No other method can match these important benefits of the DeVilbiss pressure-feed system.

- 1 DEPENDABILITY! Delivery is always consistent, and not dependent on proper functioning of pumps and other mechanical devices.
- 2 EFFICIENCY! Direct-applied pressure eliminates pump or booster mechanisms that take extra power to operate.
- 3 LOW OPERATING COST! Requires less air than any other type pressuresupply system.
- 4 FOOLPROOF OPERATION! No moving parts to wear, bind up, or get out of order.
- 5 ACCURATE ADJUSTMENT! Sensitive regulation of direct-applied air pressure guarantees more accurate control throughout wider range of pressures.
- 6 DURABILITY! One-piece, galvanized boiler-plate shell has no wear-out.
- 7 UNIFORM FLOW! The steady force of static pressure is unmatched for delivery with absolutely uniform flow rate.
- 8 NO PULSATION! No pumping action to set up surge and cavitation cycles.
- 9 EASE OF CLEANING! Simple, seamless container; full-open top; no complicated mechanism.
- 10 LOW COST! Initial purchase is less. Maintenance is negligible.

DeVilbiss Pressure-Feed Tanks are full-drawn from one piece of $^{1}1''$ boiler-plate steel, and galvanized inside and out. Heavy, pressed-steel lids seal with a tough synthetic gasket; are secured by rugged, forged-steel clasps. Built to A.S.M.E. specifications. Sizes: 2, 5, 10, 15, 30, and 60 gallons. Additional sizes (up to 175 gallons) and special types available.

If you want the simplest, most practical means of delivering material under constant pressure, see your distributor for a DeVilbiss Pressure-Feed Tank.

THE DEVILBISS COMPANY

Toledo 1, Ohio

Barrie, Ont. · London, England · São Paulo, Brazil
Branch Offices in Principal Cities



DUST COLLECTORS - INDUSTRIAL POWER WASHERS - FLOW & DIP COATERS - SPRAY BOOTHS
OVENS - AIR COMPRESSORS - SPRAY EQUIPMENT - HOSE & CONNECTIONS - MIST COOLANT UNITS

line solutions in the range of 10 to 20% by volume. The resulting solutions are said to cost only one-quarter to one-third as much as solvent strippers of equal effectiveness.

Aluminum Paint Stabilizer

Aluminum Co. of America, Dept. MF, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

Industrial use of alkyd-base aluminum paints on a vastly expanded scale has become feasible through the development of a new additive that eliminates the deleafing of aluminum pigments in alkyd and high-acid varnish vehicles.

To be called Stabilizer Number 5. the new additive makes possible ready-

mixed formulations with acid values up to 28. A wider range of high-acidnumber aluminum paints now will become available, with long storage life assured, it is claimed.

Other advantages afforded by the stabilizer include a marked increase in the durability of the paint, and doubling of corrosion resistance against salt water and salt water spray.

Only a few ounces of additive per gallon of aluminum paint are needed to achieve these results. To determine needed amounts for a particular vehicle, simple charts are available from the company for rapid calculation.

A clear, amber liquid, the new stabilizer will be sold through the company's

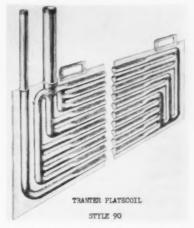
network of sales offices and distributors.

Platecoil Heat Transfer Unit

Platecoil Div., Tranter Mfg., Inc., Dept. MF, Lansing, Mich.

A new line of Multi-Zone platecoil heat transfer units features a unique arrangement of headers and passes.

The new units, through better distribution of heating or cooling media, effect operational advantages. In addition to its new pattern of heat distribution, the unit also has increased pressure containment ratings, being qualified for use up to 250 psi. Safety



factors are greater than 5 to 1 with 250 psi steam.

Better distribution of steam, (or other media), is achieved through the use of three headers which are branches of the main feed line as it enters the unit and which supply steam directly to the three horizontal zones. Each header feeds a bank of horizontal passes, the number of such passes being fed by each header depending upon the size. With this multiple header arrangement, "condensate blocking" common to coils or passes supplied from a common header or serpentine coils are practically eliminated.

Styles, sizes and metals suitable for practically all types of process tanks as well as waste heat recovery, ovens and furnaces, heat screen and a wide range of industrial and military applications are available. Units are available in mild steel, stainless steel, Carpenter 20, Monel, Hastelloy B, Hastelloy C and nickel. All stainless steel and alloy units affected by cold working are annealed and pickled after fabrication to return the metal to its



Tygon linings are really economical. Not necessarily from the standpoint of low first cost (which can be very misleading), but more important, they provide greater corrosion resistance — more positive protection, hence longer trouble-free service life. Tygon's outstanding resistance to oxidizing acids, alkalis, oils and greases make it suitable for jobs too tough for other lining materials to handle. Excellent dielectric properties guard against current loss. Nonoxidizing, flexible, and resilient, it resists aging, wear and abrasion.

Where solution visibility is important, Tygon white linings permit maximum visual quality control. Seamless, jointless Tygon linings are installed by a licensed Tygon applicator in your area, reducing delivery time and freight costs to a minimum.

Tygon is the perfect membrane for oversheathing with USSCO acid brick. Built-in-place tanks, tank piers and foundations are lined at your plant to your specifications by trained field applicators. And our engineering service stands ready to help with all your lining problems.

257-E

Send for your copy of the fact packed, illustrated Tygon Lining Bulletin No. TL-526 J. S. STONEWARE

AKRON 9, OHIO

original condition and thus eliminate the possibility of corrosion due to internal stresses and carbide precipitation.

The unit consists of two embossed metal sheets of 14 or 16 gauge, spot welded together to form channels for the passage of heating or cooling media. They are furnished in a variety of sizes up to 22½ "in width and 143" in length. Styles include double embossed or single embossed (one side flat), plates curved or rolled to specified diameters and styles with passes arranged to keep all threaded connections above the solution level of an open tank as well as styles for making the pipe connections through tank walls. To add to their versatility, any num-

ber of single units may be assembled into banks.

Chromic Acid Mist Detector

Mine Safety Appliance Co., Dept. MF, 201 No. Braddock Ave., Pittsburgh 8, Penna.

A new chromic acid mist detector operates on the same colorimetric test principle as the former Samplair but employs freshly sensitized filter papers instead of factory-impregnated filters.

Sensitizing reagents are supplied in a sealed plastic tube and enclosed glass ampoule, and do not deteriorate during long storage. A mixture for sensitizing a number of filter papers can be prepared quickly and simply without open-



ing the flexible tube. Mixed reagent is good for one day. Four strokes of a hand pump, after the filter is sensitized with one or two drops of mixed reagent, produce a color change if chromic acid mist is present. Comparisons with a reference color standards card indicate the amount present.

The detector is supplied in a carrying case and includes four reagent syrettes and 24 filter papers. Additional syrettes and filter papers are available separately in any quantity.

Fiber Glass Tank Liners

Myco Co., Inc., Dept. MF, 705 East Pleasant St., Belvidere, Ill.

Tank liners are built to specification of laminated seamless fiber glass and plastic resin formed and set under pressure and heat. Liners are fitted to wooden tank, constructed of plywood, reinforced with structural wood members. The liner extends over the edge and includes a 12" skirting.

Tanks and liners are available in most sizes and shapes and will outlast other types many times, due to high corrosion resistance to acids and caustics and high resiliency to impact. Liners also provide a high degree of electric and thermal insulation. They are form stable at temperatures up to 240°F. and, on special order, to higher temperatures. Two- to four-week delivery is being quoted. Also available are formed, laminated fiber glass anode



covers and reliner service for all wood and metal tanks.

Mechanical Timer for Spraying Machines

Binks Mfg. Co., Dept. MF, 3122 Carroll Ave., Chicago 12, Ill.

A unique new control mechanism is designed for use on either rotary or vertical and horizontal automatic spraying machines to substantially reduce overspray and material use. This new electro-mechanical control timer is designed to control individual spray guns so that the spray pattern follows the outline of the product and actuates the guns only when there is a surface



to be sprayed. Material savings of up to 45 per cent are thereby effected, it is claimed.

The control can be adapted to existing reciprocating or rotary spray machines and replaces electronic or other complicated controls previously in use. The control pattern is more accurate and there is no discrepancy.

The control components employ a mechanical "memory" system which is unaffected by surroundings. Maintenance is thus greatly simplified. The "Memory" timer is a precision instrument, yet, is practically indestructible. It is encased in an individual housing that absolutely prevents the entry of dust and dirt from surrounding processes.

Overhead Conveyor

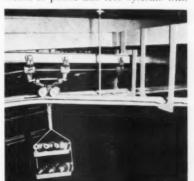
Cable-Link Conveyor Div., Dearborn Fabricating and Engineering, Dept. MF, 19440 Glendale Ave., Detroit 23, Mich.

A new overhead conveyor development permits switching trolleys from one conveyor to another or into a free, gravity system. The carriers travel in the free system by gravity or may be switched to another power system for dipping or heating operations such as: painting, cleaning, impregnating, drying, or baking.

The free trolleys travel on a lower track that is supported from the monorail, when in the power system. All



power and movement is provided by standard cable-link trolleys, links, drives, and corner turns. Existing Dearborn cable-link systems can be converted to power and free systems with



slight modifications. When in the free system, the free trolley and load move by gravity until switched into the power system and picked up automatically by the cable-link trolleys. Transfer from power to free is executed by a simple mechanical switch, manually, hydraulically, or air-operated.

PVC Expansion Joint

Walworth Co., Dept. MF, 750 Third Ave., New York, N. Y.

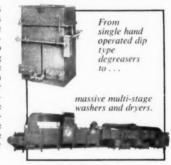
A rigid polyvinyl chloride (PVC) expansion joint, which is fully guided even when completely extended, has a maximum traverse of four inches. It compensates for variations in length on long straight runs of both normal impact and high impact PVC pipe due



But, Felmley, wouldn't a Blakeslee be more practical?

Specify BLAKESLEE Machines for Faster...Lower Cost Parts Cleaning!

Blakeslee Niagara Metal Parts Washers thoroughly spray surfaces, crevices and blind holes 100% grease-free to reduce rejects—speed up production. Blakeslee Solvent Vapor Degreasers use less solvent to clean parts of any size or shape while doing a faster, more thorough job. Most Blakeslee Machines are available with Branson "Sonogen" Ultrasonic equipment. And for additional savings specify BLACOSOLV—the fast-acting degreasing solvent with the original neutral stabilizers that prevent solvent breakdown and are carried over in the distillation process. Have your Blakeslee man make a free cost analysis of your cleaning operation—write today!



Department 102-E 1844 So. Laramie Ave. Chicago 50, Illinois

G. S. BLAKESLEE & CO.

to changes in temperature. Normal impact PVC pipe has a co-efficient of linear expansion about five times that of steel; high impact PVC, about ten times that of steel.

Specially designed O-rings in the new joint assure an absolutely tight seal. The joint will hold at pressures which are well above five times the maximum recommended pressure for the equivalent size Schedule 80 pipe.



The expansion joint is available in sizes ½ inch through four inches with threaded, flanged or socket-weld ends.

Laboratory Pipette

Arthur S. LaPine and Co., Dept. MF, 6001 South Knox Ave., Chicago 29. Ill.

The Pumpett automatic pipette control makes it unnecessary to fill a laboratory pipette by mouth suction. which can be dangerous as well as distasteful. It is designed for operation with one hand, either right or left. The thumb presses a large rubber bulb at the top to provide suction, and the forefinger operates the coarse air control valve.



All sizes of pipettes can be acommodated, even microcapillary, in the rubber-lined chuck jaws. These jaws are spring-loaded and operated by a lever to clamp or release a pipette. Pipettes need not be touched by hand at all.

Organic Finish

Howley Chem. Co., Inc., Dept. MF, 26 Howley St., Peabody, Mass.

Elastomer #614, a new protective coating, is basically a one-part allophonate, pre-polymerized. Above average film strength, unusual resistance to chemical attack, high-gloss and capacity for excellent adhesion to an almost limitless variety of surfaces are some of the advantages claimed for the finish.

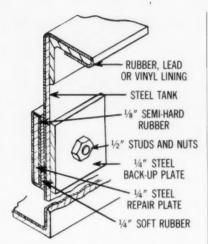
Although it is expected to be most widely used for spray application, it will also produce excellent results in brush or dipping processes as well. The material is available both clear and colorless as well as pigmented in a variety of colors and can be procured in various degrees of gloss.

Other important properties are: non-toxicity, extraordinary elasticity (flex impact greater than 60%), as well as resistance to acids, alkalies, brine, unusual weather conditions and a wide variety of other corrosive and destructive elements.

Repair Plate for Lined Tanks

Carl Buck & Associates, Dept. MF, Essex Fells, N. J.

Leaking. lined acid tanks can now be repaired in minutes in position with the new Camac repair plate shown on the sketch. The plate is covered with 1's" thick semi-hard rubber and then a 14" soft rubber gasket is vulcanized on the tank side of the plate. The plate



comes with studs, nuts, and back-up plate. The back-up plate is used as a template to drill through tank from the lining side with a ½" drill. The studs are inserted on back of the repair plate through the holes, the back-up plate placed over the studs and the nuts tightened to complete repair. No solvents or cements are required.

Cleaner - Phosphatizer

Cowles Chem. Co., Dept. MF, 7016 Euclid Ave., Cleveland 3, Ohio.

A new member of the line of Ty-Bond phosphating chemicals R-1 not only cleans the surface of the metal but also produces an amorphous iron phosphate coating on ferrous metals, zinc and cadmium. The process produces coating weights up to 60 milligrams per square foot, providing an adequate base for paint adhesion and maximum corrosion protection, it is claimed. The manufacturer also supplies a special Rinse #10 to be used for sealing the coating when required.

The process provides an economical method of removing light oils and shop dirt from fabricated metal parts while at the same time applying an iron phosphate coating to the surface to increase paint adhesion and give corrosion protection. It is easily and safely handled, being a granular powder, quickly soluble at operating temperatures. Control of the operation is obtained by a simple titration method using kits provided at no charge to customers.

Ultrasonic Cleaning Systems

Branson Ultrasonics Corp., Dept. MF, 40 Brown House Road, Stamford, Conn.

Complete ultrasonic cleaning systems are now available in matched counter-



PAY FOR THE METAL
DON'T PAY FOR SPECIAL SHAPES

With Handy & Harman rolled anodes, you buy exactly what you need in length, width and thickness . . . your initial cost is lower and you've got less cash tied up in inventory.

Another Handy & Harman "added anode attraction" is the range of available finenesses. If you don't need extra fineness, you can specify exactly what you want, and get it. As always, standard requirements are fully met with Handy & Harman's 999 + FINE. And, you can specify any fineness above that grade for your particular needs.

We'd like very much to review with you your anode costs and show you how—with Handy & Harman rolled anodes—you buy the metal you need, not the shape.

When all is said and done

Handy & Harman's Refining Division is very much interested in your left-overs. Your silver plating solutions, sweeps, scrap and waste get the most rewarding attention when you send them to us. Accuracy with what is yours is the basis on which this service is offered. Address your next shipment to the nearest refining station listed below and profit thereby.



HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

BRIDGEPORT, CONN. • PROVIDENCE, R. I. • CHICAGO, ILL. • LOS ANGELES, CALIF. • TORONTO, CANADA

Ship Refinings to the nearest of these plants

EAST COAST

82 Fulton St. Bridgeport 1, 425 Richmond St. New York 38, N. Y. Conn. Providence 3, R. I. El Monte (Los Angeles), Calif. Chicago 22, Ill.

height cabinets. The series C cabinets, welded of 16-gage type 316L stainless steel to uniform dimensions (26x24x32 in, high), house the Sonogen generator, the cleaning tank, filter, rinse tank, and dryer.

Many different combinations and arrangements are possible, depending on individual needs of the user. A standard installation consists of three basic units: generator, tank, and filter. To these, rinse tanks and dryer may be added, to handle the work load in minimum time and maximum conveni-

R-F output of the ultrasonic generator at 40 kc is 500 w average, 2000 w peak on pulses. Power input is 1.5 kw, 115 v a-c (50 to 60 cycles), or 220 v single-phase a-c. Generator is forced air-cooled, has a circuit breaker with indicating light, and a line voltage control with meter for maximum stability.

Two plumbing connections provide inlet and drain for the solution, which is constantly recirculated to the filter. The stainless steel recirculating filter has a removable cartridge, with a 3 to 5 micron retention (1 micron avail-



ONLY KENVERT® ASSURES TROUBLE FREE RESULTS ON CADMIUM

After months of research, KENVERT has finally developed a compatible brightener and bright dip to assure uniform results on cadmium plate. The brightener—KENVERT NO. 25-LM—available in liquid form, is easily diluted and easy to use. It gives uniform reproducible results with any of the KENVERT powder chromating treatments; whether clear bright, iridescent, or olive drab. You will have maximum protection with substantial savings.

KENVERT NO. 25-LM ADVANTAGES

- Perfect Chromating Results
- Uniform Brightness
- Good Solderability
- Ductile Deposits
- · Excellent Throwing Power
- · Easily Diluted
- Non-Pitting
- Easy to Maintain

Use with these KENVERT Powders

KENVERT NO. 27

Clear, White, Bright

KENVERT NO. 18-M

Iridescent, Hard Wet Film Strength

KENVERT NO. 11-PC

Olive Drab, Hard Wet Film Strength

.



CONVERSION CHEMICAL CORPORATION

100 E. Main Street, Rockville Connecticut Phone: TRemont 5-3357

Licensee: Nicromatic Ltd., Toronto, Canada

Distributors in major industrial United States cities

able). A 6-kw strip heater is part of this unit, thermostatically controlled to keep the cleaning medium at the desired temperature.

Either spray or immersion rinsing is possible in the rinse tank. A retractable hose and a manual valve for connecting the tank to the shop air system are also provided.

A thermostat in the heater and blower circuit of the dryer tank permits any temperature between ambient and 200° F. to be selected. Power requirement for this unit is 6 kw.

When all five units are next to each other, their total width is 10 ft. 10 in. Counters of generator and filter are flush, and hinged in the rear; other countertops are welded into position.

All cabinets are supported on leveling feet, or may be ordered with casters.

Polymer Linings for Wood Tanks

Wendnagel & Co., Inc., Dept. MF, 600 W. Cermak Road, Chicago 16, Ill.

A new type of lining for wood tanks is made of various polymers: polyvinyl chloride for use in handling most all inorganic acids and bases, bleach, and many organic solvents; polyethylene linings for organic solvents and inorganic solutions.

"Polycel" tanks (wood tanks with polymer linings) are said to be less costly for both labor and material than methods formerly used, and much less costly than rubber lined steel or alloy



metal tanks. Linings are heat sealed into a bag liner made to fit the inside of the tank. These can be furnished for round or rectangular tanks, new, or already in use. They are custom-made for particular needs and conditions.

The most convenient method of installation is to apply the liner loose in the tank and fasten it to the wood around the top or carry the liner over the top and fasten outside. Where necessary, the lining can be cemented to the tank.

Fittings are easily connected to the tank with the liner in place, much in the same way as regular wood tank fittings. In some cases it is possible to use plain steel or galvanized fittings with a sleeve made of the tank lining running through the fitting and ending with a flange for outside connection. Where the tank is subjected to abuse that might damage the lining, a separate protective lining of boards, plywood or rigid PVC can be added to the inside at low cost.

Water Wash Compounds

Octagon Process, Inc., Dept. MF, 38 Bank St., Staten Island 1, N. Y.

A new series of "controlled flotation" water wash compounds has been formulated specifically for use with modern epoxy, asphaltum, acrylic, ureas, and similar paint spray booth operations. These compounds are ideal for use in high speed, low maintenance spray booth systems.

"Skim-Off" compounds combine with the paint particles to form tiny, non-clogging, non-sticking droplets which float on the surface of the tank. They are easily skimmed off. Lines remain open and free at all times. Water curtain cannot break due to nozzle stoppage. Walls, baffles, backdrops and fan blades in spray booths remain free of paint build-up. All compounds are formulated with built-in anti-foaming qualities to inhibit the formation of soaps due to chemical reactions, it is stated.

Each in the series is furnished as a free-flowing powdered and granular mixture which dissolves quickly in water. Each compound is simple to control by standard pH or titration tests.

#382—For use with epoxy finishes. #383—For use with heavy pigment primers, such as asphaltum types, including gilsonite base coatings.

#384—For use with acrylics, polyurathanes, polyamids and similar plastic coatings.

#385—For use in spraying different finishes, including phenolics, alkyds, ureas, and oil-based finishes.

Paint Booth Coating

Adhesive Products Corp., Dept. MF, 1660 Boone Ave., New York 60, N. Y.

When Zipcote Stik-Pruf Coating is applied to conveyors, belts, or spray booths, any accumulation of paint, lacquer, varnish or other materials can easily be stripped off, leaving a clean surface wherever the material has been applied.

It can be applied by brush or spray, is non-inflammable, inexpensive and easy to use. It may also be applied to work tables and any surface which must be protected from glue or paint, and is available in 1 and 5-gallon containers as well as 55-gallon drums.

All-Purpose Hand Trucks

Wilder Mfg. Co., Inc., Dept. MF, Port Jervis, N. Y.

A complete new line of moderately priced materials handling trucks comprises sixteen different styles, each available in any of four standard sizes and include platform bin, table, shelf and box trucks, in a wide selection designed to fill the medium duty materials handling needs of almost any type of manufacture.

Constructed of heavy duty sheet steel, each item in the new line features a smooth interior that can be used for moving the most delicate materials without fear of damage.





Each truck normally comes equipped with easy-rolling 5" diameter hard or soft rubber casters, but manufacturer can also furnish them with caster diameters ranging from 3" through 8", as required. All trucks in the new line can be shipped knocked down, for easy assembly by the end-user.

Air Dryer and Receiver

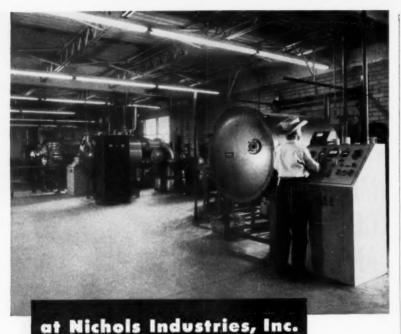
Van Products Co., Dept. MF, 5759 Swanville Rd., Erie, Pa.

A compressed air receiver tank with built-in air dryer is designed (a) to purify and dry the air to zero-dewpoint quality, then (b) to store and deliver the air clean and free of moisture to overcome fouling, corroding and freezing of tools. This compact, single-vessel design requires a minimum of space, installation, maintenance, inspection and insurance. It operates without heat, regeneration or regulation; with no volume loss and less than 1% pressure drop. Capacities are up to 8000 scfm and 6000 psig.

Corrosion-Proof Air Washers

Industrial Plastic Fabricators, Inc., Dept. MF, Endicott St., Norwood, Mass

A new line of air washers, entirely fabricated of rigid polyvinyl chloride, is now available in a range of capacities from 1,000 to 54,000 cubic feet per minute. Designed to handle acids, alkalies and corrosive fumes more economically and efficiently, these air washers



Stokes Vacuum Metallizers help toy maker capture new markets

Aluminizing metal parts of toy pistols and rifles has paid off handsomely for Nichols Industries, Inc., Jacksonville, Texas. Now one of the world's largest toy gun manufacturers, Nichols credits its four 48-inch Stokes Vacuum Metallizers with a big assist in speeding production and cutting costs, enabling the company to introduce new low-price items and become a leader in this competitive market.

Nichols operates its Stokes metallizers around the clock, aluminizing zinc castings one to twenty inches in length. Vacuum metallized parts have a more brilliant finish than the previously electroplated items, and production time and labor are far less. The dependability, ease of operation and low maintenance of the Stokes units help keep costs low.

Vacuum metallizing offers attractive opportunities for many products made from many materials...including metal, plastic, glass, paper and textiles. And Stokes design and operating features assure you the full benefits of the process. Stokes offers valuable aid in planning your vacuum metallizing facilities...selecting the correct equipment... training operators. Contact your nearest Stokes office for a discussion of your requirements, or write for data on Stokes Vacuum Metallizers.

Vacuum Equipment Division F. J. STOKES CORPORATION 5500 Tabor Road, Phila. 20, Pa.



will clean 96% to 99% of contaminants that are instantaneously soluble in water, such as chromic acid, sulphuric acid, caustics, etc., it is claimed.

In operation the air washer employs a three-way action. 1. Air enters the first section where velocity is decreased and the air is thoroughly sprayed through specially designed PVC nozzles.

2. The air enters the Raschig rings washer bed. PVC rings, thoroughly wetted, change air directions at least eight times for complete cleaning action. 3. Air is fed through the eliminator section where particles of heavily entrained water are removed. This leaves 97% saturated clean air to enter the exhaust fan.



Where difficult removal problems are encountered, such as nitric acid, etc., a second spray and washing section can be used for increased efficiency. The second section will remove contaminants in the same ratio as the first.

One of the economy features of the air washer is the low water consumption, approximately 1 gallon per 1000 feet of air handled. This amount can be lowered on special applications. All structural members, spray nozzles, piping, Raschig rings, bolts and nuts used in the air washers are made of PVC. An external metal base, for added strength, is located entirely outside the corrosion area. Since they weigh only 1/6 as much as a unit of comparable capacity made of steel, no additional building supports are necessary for roof-top installation. The units have easily removable side and top plates for accessibility.

In addition to the standard sizes, larger capacities are available to special order with inlet and outlet diameters available to specification.

CORRECTION

On page 59 of the January issue (Effects of Impurities in a Bright Nickel Bath on the Covering Power of a

Chromium Bath. By R. H. Rousselot and G. E. Rousselot), the third conclusion is to the effect that an increase in covering power of chromium without any great change in the appearance of the nickel plate may be attributed to inorganic contamination of the nickel bath. The authors have informed the editor that the contamination is organic, not inorganic, for any metallic contamination will affect the appearance of the nickel before a noticeable change takes place in the covering power of the chromium.

BUSINESS ITEMS

Crown Rheostat and Supply Co. Appoints Frederick Gumm Chemical Co. Distributor

Crown Rheostat & Supply Co. announces the appointment of Frederick Gumm Chemical Co. as a distributor for its general line of fully automatic plating equipment, and also the line of tumbling equipment and miscellaneous items. This arrangement became effective February 1st and covers the New England states, as well as the states of New York, Pennsylvania, New Jersey, Delaware and Maryland.

Howard Martin, general sales manager of Gumm Chemical, will direct the sales organization from the home office in Kearny, N. J. Resident representatives will staff each of the several district areas.

Ed Jevely from Boston covers the state of Massachusets. J. M. Barry and J. C. Barry, living in New Haven, will cover the state of Connecticut. Al Fusco and Sid Boyer will cover Metropolitan New York, and Louis Marino the state of New Jersey. Vincent Caswell from Philadelphia will cover the state of Pennsylvania.

Charles Clark, residing in Rochester, will cover Western New York State, and Foster Applegate, from Syracuse, will cover the East Central area of New York State.

This distributorship arrangement expands the services of both Gumm and Crown throughout the electroplating industry in the Northeastern area of the country.

Pinner Appointed Manager of Electroplating Development at McGean Chemical Co.

Appointment of Walter L. Pinner as

No matter what the job ...

There's a **Luster-on**Chromate Conversion Coating to fill your Specifications

FOR BRILLIANT, CORROSION-RESISTANT FINISHES . . . rivaling chrome for many applications where cost is a factor . . . long-lasting, easily controlled applications.

FOR CLEAR AND IRIDESCENT COATINGS... most attractive appearance where corrosion-protection, humidity, handling are involved during processing... at extremely low cost.

FOR DECORATIVE COLOR... on economical zinc... scintillating golds, yellows, blues, greens, violets, reds, brass and copper hues.

 $\mbox{\bf FOR ALUMINUM}$. . . where the surface hardness of anodizing is not required.

FOR LASTING BRIGHTNESS... on copper and brass without noxious fuming.

FOR DIE CASTINGS . . . uniform, low cost finish ideal for later painting.

LUSTER-ON means economy! LUSTER-ON proved formulas mean excellent operating control!

Data Sheets and Prices on Request



58 Waltham Avenue, Springfield 9, Mass.

West Coast: Crown Chem. & Engr. Los Angeles & San Francisco Canadian Licensee:

Alloycraft, Ltd.



... LEADER in

Electrolytic Precious Metals!

ONE OPERATION Antique Gold Solution ONE OPERATION French Grey Solution

A Rich French Grey that Improves Quality and Costs Less!

OTHER DAVIS-K PRODUCTS:

- HARD GOLD SOLUTION for Printed Circuits and Electronic Parts
- . POTASSIUM GOLD CYANIDE SALTS
- . LUSTROUS WHITE RHODIUM SOLUTION
- Variable-type Tank Rheostats, specially designed for precious metal plating.

ALL DAVIS-K GOLD PLATING SOLUTIONS ARE:

- · Made in all colors
- Color constant
- . Tornish-resistant
- · Brilliant in finish
- . Bottled by Troy Weight
- Made from assayed US Treasury Gold only
- · Ready for immedaite use

We are fully equipped to reclaim old gold and rhodium solutions. No charge for small sample plating.

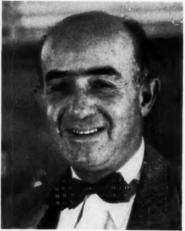
Write Dept. MF for details.

FREE
Consultive Service
Call on Davis-K
process engineers
for help with your
special plating problems and installations.



manager of electroplating development has been announced by *The McGean Chemical Co.* Mr. Pinner, previously with Houdaille Industries for 35 years, is chairman of the International Council appointed jointly by the American Electroplaters' Society and the Institute of Metal Finishing of England to organize the Fifth International Conference on Electrodeposition and Metal Finishing, to be held in June as part of the Golden Jubilee Convention of the A. E. S.

Mr. Pinner, a graduate in chemical engineering from the University of Michigan, served Houdaille Industries as plant chemical engineer, chief chemical engineer, manager of research and



Walter L. Pinner

development, and process engineer. During World War II he served as technical manager of a group of 279 chemists, chemical engineers, physicists and metallurgists assigned a vital role in the atomic bomb project.

He is the author of approximately 50 technical papers in the field of metal finishing and corrosion published through the SAE, AES, The Electrochemical Society and the Journal of the Institute of Metal Finishing of England. His four gold awards for technical papers outnumber those conferred on any other author.

Mr. Pinner has served in all of the offices of the National Society of the American Electroplaters, and was supreme president in 1945. He has also held all offices of the Society's Detroit Branch. In 1949 he became the first American to be elected an honorary member of the Institute of Metal Finishing.

Chairman of a project committee operating for the American Electroplaters' Society, he was instrumental in initiating the research program related to the development of a dependable method of accelerated corrosion testing for use on plated coatings. Mr. Pinner also is a member of the A. E. S. Research Committee, and served last year as president of the Society's Order of Past Presidents.

Among his many other honors is a citation by the Ohio State Health Department for his work as first chairman of the Metal Finishing Industry Action Committee which cooperated with the Ohio River Valley Sanitation Commission in drawing up waste disposal regulations for an eight-state area.

Dunning Purchases Madison Plating Co.

Madison Plating Co., industrial electroplating firm, 1003 Pusheck Rd., Bellwood, Ill., has been purchased by David W. Dunning, Chicago area sales engineer for the past 13 years.

For nine years Dunning was in charge of sales for the Meaker Co., electroplating equipment manufacturer, in Chicago. He was graduated from Stanford University with a B.S. degree in mechanical engineering.

Armour Alliance Industries Formed

Formation of Armour Alliance Industries by combining the coated abrasives, cushioning products and adhesives operations has been announced by Armour and Co. Headquarters of

the new organization will be at Alliance. Ohio

Carl B. Johnson is named general manager, succeeding R. L. Reeves, resigned.

Mr. Johnson was formerly production manager for the Soap Division in Chicago. He joined the firm in 1949 as general superintendent of the auxiliaries.

R. W. Gutheil, formerly general manager of the Adhesives Division, is appointed marketing director of Armour Alliance Industries, a newly created position. Mr. Gutheil has been with the company since 1954.

Dennis Chemical Co. **Elects Officers**

Dennis Chemical Co., St. Louis, Mo., announces election of Sidney Dennis as president, and Frank Gollub as vice president in charge of research and development. New appointments include Milton Carlie as sales manager, and Marvin Wool as chief chemist.

Techline Names Sales Representative

Appointment of Wilson B. Green. R.R. #2. Box 237, Laurel Lindale Road. New Richmond, Ohio, as sales representative has been announced by the Techline Division of Wheelabrator Corp., Vicksburg, Mich. His territory includes the southern part of Ohio, the eastern half of Kentucky, and most of the state of West Virginia.

Mr. Green has been engaged for over 16 years in the field of metal processing and finishing, specializing in automatic processes in both the finishing and plating fields. He has been a representative for several leading manufacturers of custom-built finishing and processing equipment, chemicals and supplies. This background has given him a complete understanding of the many phases of close tolerance finishing, which requires the use of wet and dry blasting and barrel finishing, and the use of the proper compounds and abrasives for such applications.

Technical Manager Appointed by Pfaudler

The appointment of Cloyd L. Betzer has been announced as technical manager at The Plaudler Co. In his new position he will be responsible for all engineering research and development activities with the exception of production and industrial engineering. He will continue as chairman of the development coordinating board and be-



NOTE THESE FEATURES . . .

- 1. Unobstructed tank walls. Condensing coil and condensate pan are recessed providing superior vapor control, effective solvent reclamation and unobstructed working агеа.
- 2. Demand type water control. Insures using water only when needed, thereby reducing operating cost. Placement of nickel plated condensate coils in conjunction with new type water control eliminates water condensation along the sidewalls of degreaser, thus, prevent-ing rusting of the sidewalls and acid solvent, increasing the life of the degreaser.

SINCE 1923

EQUIPMENT COMPANY

Will last twice as long!

Reduce solvent costs 30% or more!

Cut labor costs!

Up to 40% less maintenance!

- 3. New pump design. All pump parts are fabricated of stainless steel. The rotor and end plates are nickel clad. Rotating magnetic field drives impellor, thus, the pump is com-pletely sealed except the intake and outlet, preventing leakage.
- 4. Lower height. Working height reduced for easy operation.
- 5. Built-in storage tank. Holds adequate reserve for flushing in addition to entire contents of degreaser sump.
- Less floor space. Designed to operate from either side.

OVER 208 STANDARD MODELS ... including Circosonic ultrasonic de-greasers. All backed by nation-wide technical field service.

YOUR INQUIRY BRINGS comprehensive 32-page vapor degreasing manual.

Offices in principal cities 122 Central Avenue, Clark (Rahway), New Jersey CIRCO-SOLV (Trichlorethylene) PER-SOLV (Perchlorethylene) Vapor and Ultrasonic Degreasers . Metal Parts Washers . Dryers . Solvent Recovery Stills

> comes a member of the management committee.

> > Betzer joined the firm in 1957 as a member of the staff of the vice-president in charge of manufacturing. Prior to that, he was divisional heating engineer with Delco Appliance Division of General Motors Corp.

A graduate of Cornell University, Betzer holds a degree in mechanical engineering. His twenty year industrial experience includes responsible positions in research, product design, plant engineering, manufacturing, and tool design.



Cloyd L. Betzer

Crisenbery Chief Engineer of Arthur H. Losey Co.

Eugene Crisenbery is now chief en-



Eugene Crisenbery

gineer of the Arthur H. Losey Co., Jackson, Mich., manufacturers of automatic polishing and buffing equipment, and sales outlet for metal finishing supplies and equipment.

Mr. Crisenbery studied at Jackson Jr. College, and the University of Arizona and, formerly, was associated with Industrial Designers and Hughes Aircraft on guided missile test equipment. He will be in charge of the designing and manufacturing of machinery and fixtures for automatic finishing.

Kauffman Appointed Ceilcote Plant Manager

Donn K. Kauffman has been appointed to the position of plant manager—plastics division of The Ceilcote Company. He will be responsible for all



Donn K. Kauffman

phases of manufacturing reinforced plastic ventilating and processing equipment.

Prior to joining the firm, Mr. Kauffman was employed by the Fruehauf Trailer Co. and the Cleveland Tank Division of General Motors.

Diversey Adds Subsidiary in Italy

Diversey Corp., manufacturer of industrial chemicals and detergents, acquired a new subsidiary in Italy making a total of nine subsidiaries and affiliated companies operating outside of continental United States.

The firm, in announcing the formation of the new subsidiary to be known as Diversey Italiana, S. p. A., stated that it was formed in partnership with Italian and French interests and will operate on a national basis from its headquarters and factory in Milan. The products will be manufactured according to U. S. specifications for the food and metal industries.

Cernik Joins American Buff Co.

Rudy Cernick has joined American



NUGLU

THE IDEAL ADHESIVE

For Setting Up or Recoating Polishing Wheels, Abrasive Belts & Discs

Nuglu, a liquid glue, developed to lengthen wheel life — produce a better finish, and increase metal finishing production.

BRUSHING NUGLU

A mixture of Nuglu and graded aluminum oxide

Save on operating costs, increase production, reduce wheel inventories, and obtain greater results, with less costly materials, in fine polishing work!

Ask for information on The Siefen Finishing Systems

— Also for better metal finishing use Siefen Compositions ● Stainless Steel ● Bar (Grease) in Tube ● Liquid Tripoli ● Liquid Grease ● Lapping Compound ● Burring Compound.

Siefen For Service

J. J. SIEFEN CO.

5643 LAUDERDALE, DETROIT, MICH.

*1927 Our

Our Thirty-First Year

1958*

OFF YOUR TOP BRASS USE TRUE BRITE

BRASS SOLUTIONS

Trouble Free — Low Cost
Little Supervision Needed
Ready To Use — Just Add Water
Uniform Color — Can Match Colors
Write For Bulletin on Brass Plating

TRUE BRITE CHEMICAL PRODUCTS CO.
BOX 31, OAKVILLE, CONN.

Buff Co., Chicago, manufacturer of buffs and polishing wheels, as sales representative in Eastern Michigan and Western Ohio. He formerly conducted his own swimming pool construction business in Chicago, and will work out of the Detroit office at 2970 West Grand Blyd.

Harry Parsons, who has represented the company in Ohio and Western Pennsylvania for the past three years, has been transferred to the New England territory. He will cover the states of Connecticut, Rhode Island and Massachusetts. Parsons is a native of Connecticut and will make his headquarters in Newton, Conn.

Robert Hulland, formerly the firm's representative in eastern Michigan for three years, will represent the manufacturer in upstate New York and eastern Ohio.

Glen Beckwith has joined the company as sales representative for the state of California. He was formerly with Metallon Products and Kwikset Locks, Beckwith will headquarter in Los Angeles. He is a registered professional engineer and an active member of the A.E.S.

Acoustica Organizes New Divisions

Acoustica Associates, Inc. of Mineola, N. Y. and Los Angeles, manufacturers of ultrasonic equipment, has organized separate Eastern and Western divisions and has named four of its executives to new positions within the company.

Gerald M. Henriksen was named executive vice president, in charge of all divisions. He was formerly vice president and director of engineering.

Ralph Reynolds was appointed general manager of the Eastern division



Stanley R. Rich Ralph Reynolds



Gerald M. Henriksen

Frank P. DeLuca

and continues as vice president and director of the company.

Frank P. DeLucca was named general manager of the Western division and elected a director of the company. He continues as a vice president.

Stanley R. Rich was named vice president of Acoustica and continues as president of the General Ultrasonics Co., Hartford, Conn., a wholly-owned subsidiary.

Cochrane Corp. Names Manager of Industrial Waste Department

George E. Glover has been named manager of Industrial Waste Department of the Cochrane Corp., Philadel-





George E. Glover

phia, Pa., and will be in charge of the company's activities in industrial waste treatment and special ion exchange applications.

Mr. Glover is long experienced in the design, application and operation of industrial waste water treatment equipment including that of metal working solutions. He is also an author on this subject and a member of the Committee of the American Water Works Association for Underground Disposal of Wastes.

New Representatives for the Pioneer Rubber Co.

Two new appointments of representatives for the Industrial Products Division of *The Pioneer Rubber Co. of Texas*, have been announced by the company's main office in Willard, Ohio. J. Donald Burvee will make his headquarters in Kansas City, Mo., to serve the territory including West Missouri, Kansas, Oklahoma, South Wyoming and Colorado. Before joining the firm, Mr. Burvee was employed as district sales manager for Standard Milling. A native of Missoula, Mont.. he attended the University of Montana.

R. M. "Bob" Wilson will represent the company's industrial glove products in the Texas and New Mexico area, Mr. Wilson's experience, prior to his appointment, took him into the field of retailing and oil sales.

Grunwald Named Research Chemist at MacDermid Inc.

Jean J. Grunwald has been named research chemist of MacDermid Incorporated, Waterbury, Conn., manu-



Jean J. Grunwald

facturer of metal cleaning, plating and finishing chemicals. He received his B.S. degree in Chemical Engineering in 1956 from Polytechnical School University, Lausanne, Switzerland, and his M.S. in Chemical Engineering at Columbia University in 1958. From 1956 to 1957 he was employed in the Plastics Engineering Department of Northern Electric Co., Ltd., Montreal, Canada.

Mr. Grunwald worked as an AES "Project 12" fellow studying the effect of organic films on adhesion of electrodeposits. He will begin work in the Waterbury research laboratory on metal finishing problems.

Calabrese Made V. P. at Grieve Hendry

Effective immediately, P. J. Cala-



P. J. Calabrese

brese is elevated to vice president of Grieve-Hendry Co., Inc., Chicago industrial and laboratory oven and furnace manufacturer. Calabrese, formerly sales manager, will remain in charge of sales in his new position.

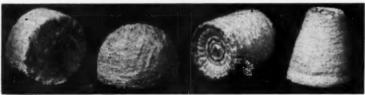
Prior to joining the firm, Calabrese had managerial positions with Minneapolis-Honeywell and Cramer Controls.

New Sales Reps. for Infilco

Infileo Inc. of Tucson, Ariz., announces the appointment of Allen I. Barry as sales representative in all the New England states except Connecticut. His headquarters will be in Milton, Mass.

Mr. Barry, a graduate in Chemical Engineering of Rensselaer Polytechnic Institute and member of the Pollution Control Engineering Committee of the American Institute of Chemical Engi-

BUFFS FOR INSIDE POLISHING



GOBLET BUFFS, TAPER BUFFS, CYLINDER BUFFS, SMALL POLISHING WHEELS, RAZOR EDGE BUFFS, and many others for deburring, polishing and grinding any internal contour.

Write for additional information or contact your local dealer. These buffs are stocked by many dealers throughout the country.

stocked by many dealers throughout the country.

We manufacture a COMPLETE LINE OF BUFFS including full disc loose and sewed buffs and polishing wheels. Our metal center BIAS TYPE BUFF may help cut your polishing costs.

Your request on your letterhead will bring our complete catalog by return mail.

ESTABLISHED 191

1660 Summerfield Street Brooklyn 27, N. Y.

Canadian Distributor — LEA PRODUCTS COMPANY, Montreal



Allen I. Barry

neers, was formerly associated with Badger Mfg. Co. In addition to his general sales experience in the field of industrial process equipment, he has been most active in the application of flotation equipment to the treatment of industrial waste. Prior to his entering the industrial field, he was associated with the Pfizer Co. and Monsanto Chemicals in the production of pharmacenticals

Harry Alter & Sons of Davenport. Iowa, was appointed representative in Eastern Iowa and Rock Island County. Ill. The firm was established in 1902 to handle industrial materials and now represents many prominent manufacturing firms. Equipment will be handled by Ken, Tom and Howard Hawkins of the Iowa company's pump division.

Pennsylvania Lacquer Center Expands

Pennsylvania Lacquer Center of 131 Berlin Road, Haddonfield, N. J. are expanding their plant in Haddonfield. Five thousand square feet are being added and a large loading platform. The expansion area will be used for the manufacture of the company's new line of epoxies. The new addition will be completed this month.

Sipes Appoints Delaney

Thomas P. Delany of Maple Shade, N. J., has recently been appointed regional sales engineering representative in the Greater Philadelphia area for James B. Sipe and Co., Pittsburgh, Pa., manufacturers of industrial paints, finishes and coatings.

Formerly employed by the Felton Sibley Co. and M. A. Bruder Co. since 1947, Mr. Delany will direct the Philadelphia area sales engineering activities in the industrial finishing and maintenance fields.

Mr. Delany is a graduate of the Wharton School of Accounts and Finance of the University of Pennsylvania and a member of Merchandising Associates, a seminar group of the University of Pennsylvania,

Northwest Chemical Appoints Watson

Northwest Chemical Co., Detroit. announces the appointment of R. O. (Dick) Watson as sales and service engineer for the South Indiana area.

Dick Watson is well known in the plating, cleaning and industrial chemical field through his activities in the Grand Rapids area over the past ten or twelve years.



R. O. (Dick) Watson

He is a Chemical Engineer graduate of the University of Detroit, an officer in the National Guard, past president and officer of the Grand Rapids branch of the A.E.S.

Watson has moved his family to Indianapolis. Ind. where he will establish a regional office.

Crown Rheostat & Supply Co. Adds Kirkpatrick to Staff

Crown Rheostat & Supply Co., Elk Grove Village, Ill., announces the appointment of Arthur H. Kirkpatrick to their sales engineering staff.

An engineering graduate of the University of Michigan, Kirkpatrick has been associated with the engineering and project sales of automatic plating equipment for the past 14 years. He



Arthur H. Kirkpatrick

PRODUCTS ACID CONTAINERS ANODE HOOKS BERGLAS TANKS CTS & HOODS EEL & STAINLESS STEEL TANKS LEAD & PLASTIC

NEW . DURABLE . LIFETIME PPI TITANIUM ANODE HOOKS

This New Titanium Anode Hook Is Almost Indestructible When Used With - Nickel, Chrome, or Acid Copper Plating Solutions Advantages that will save you money . .

- No chemical or electrochemical attack on titanium hooks by plating solution
 No foreign metal to contaminate solution from the titanium hooks
 Titanium hooks can be placed completely under plating solution level . . . thus, minimizing scrap loss
 Hook threads will not decompose in plating solution
 No electrolysis on the surface of titanium that is exposed to the solution; therefore, hooks will not generate gas or decompose brighteners

NOTE: Titanium metal can't be used in cyanide or fluo-borate solutions

Titanium Anode Hooks are made of $^3b''$ square stock in $^{3}b''$ thru 8'' graduated lengths to fit $^{1}b'''$ dia. anode rod size or less. Special size hooks quoted upon request. PPI makes a complete line of anode hooks . . . Write today for prices and complete details.

A Few PPI Territories Open For Distributors . . . write for details



1509 N. WASHINGTON KOKOMO. INDIANA will cover the Detroit and surrounding trade areas from 2211 Burns St., Detroit, Mich.

Interchemical Names New Head of International Division

Francis A. E. Spitzer has been appointed president of the International Division of Interchemical Corp. He succeeds Joseph G. Morris, who is relinquishing his executive position in accordance with the company's retirement policies, but who will continue to serve the division on special assignments. Mr. Spitzer joined the company in 1939 as a member of its legal department. Named assistant secretary in 1943, he became secretary and head of the legal department in 1945. For the past two years he has served as vice-president of the International Division

Born in Paris, France, of American parents, Mr. Spitzer holds two degrees from the University of Paris and the Diploma of the Ecole des Sciences Politiques of Paris. He was also graduated from Harvard University Law School.

Detrex Promotions Announced

Detrex Chemical Industries, Inc. an-

WELDED CONSTRUCTION - Note

how welds have dissolved or broken in

use. Often caused in barrel plating

where currents are high and barrel

Write for Complete Literature

transfer is rapid.



R. B. Preston

nounces the promotion of R. B. Preston to manager of national accounts. He has fifteen years of experience with the firm, all of which has been spent in sales and thorough chemical service in the pretreatment of metals prior to finishing.

Also announced is the promotion of A. J. Hebsacker to regional supervisor in the Chemical Processing Division.

Mr. Hebsacker has spent the last nine-

PRICES — 12e per inch for basket lengths 18" or longer. Side clip 15e

extra. Increments 3". Curved containers one size only, 27" for 14" and 16"

diameter barrels 15¢ per basket addi-



A. I. Hebsacker

teen years in the field of chemical processing. In his new assignment, he and his staff will cover the states of Michigan and Indiana.

Ampco Names New Licensee Foundry

Truecast, a division of Pointer Tool Co., 1379 S. Seventh St., Louisville 8, Ky. has been appointed a licensee foundry by Ampco Metal, Inc.

As a licensee, Truecast will produce the various grades of Ampco metal as investment and permanent mold castings and will be permitted to affix the diamond trademark.

New Board Members Elected at Hercules

Five new members have been elected to the Board of Directors of *Hercules Powder Go.*

They are: Edward G. Crum, 52, general manager of the Virginia Cellulose Dept.; G. Fred Hogg, 52, general manager of the Naval Stores Dept.; Dr. John H. Long, 51, general manager of the Paper Maker Chemical Dept.; Henry A. Thouron, 46, general manager of the Synthetics Dept.; and J. H. Tyler McConnell, 44, secretary of the company. This brings the board total to sixteen, and the average age of the board to just under 54.

New Representatives Join Pennsalt

Three new representatives have joined the Corrosion Engineering Products Sales Department of *Pennsalt Chemicals Corp*. The new representatives, working out of the company's Natrona, Pa. headquarters for sales and service for corrosion resistant mortars, protective coatings, and plas-



tic topping compounds, are William S. Ewing, Thomas A. Hanna, and Allen M. Smith II.

Ewing, who attended night classes at the University of Pittsburgh and is a graduate of Carnegie Institute of Technology's Vocational Night School, was previously associated with the Aluminum Co. of America and Chemsteel Construction Co. in Pittsburgh and with R. D. Werner & Co. in New York.

Hanna, a graduate of the Pennsylvania State University, was also associated with major companies in western Pennsylvania before joining the firm. He was engaged in research for Alcoa, and sales correspondent for the Wear-Ever Aluminum Co. He also served with the U. S. Army Signal Corps as a first lieutenant for two years, during which time he attended the U. S. Government Procurement School at Fort Lee, Va. and was stationed in Korea.

Smith, a resident of Leechburg, Pa., holds a Bachelor of Science degree in Engineering from the United States Military Academy and a Bachelor of Mechanical Engineering degree from the University of Minnesota. He brings to his new position a 17-year career in engineering and production with a number of well-known companies, including Fluor Corp., Celanese Corp., J. F. Pritchard, Catalytic Construction Corp., Bechtel Corp., and Garver Tank Co., in the East, Mid-West, and West Coast.

Azzolino Joins Heatbath

Heatbath Corp. announces the appointment of Joe Azzolino as technical sales representative for northern New Jersey and metropolitan New York.



Joe Azzoline

Mr. Azzolino is a graduate of Fairleigh-Dickinson University with a B.S. in chemistry. He was employed by Wright-Aeronautical Division, Curtiss Wright Corp., for eight years and held the position of assistant project engineer when he left.

Mr. Azzolino has had wide experience in plating processes and allied metal finishing operations and is presently a member of the Newark Branch, A.E.S. He will have his headquarters at 106 Central Ave., Lodi, N. J. Telephone — PRescott 3-3570.

New Detroit Manufacturers Agency Formed

A new Detroit manufacturers agency, Air Systems, Inc., has been formed by a merger of three Detroit firms. The new organization will market American Air Filter Co.'s products, as well as its Illinois Engineering specialties.

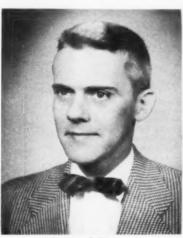
Al Saunders has been named president of the new firm; Charles Trambauer, vice president; Earl W. Graham, vice president and secretary; and Ken Wagoner, vice president and treasurer. Wagoner formerly was associated with the Trane Co. in Detroit.

Air Systems, Inc. will be located at 18263 North McNichols Road, Detroit 19. The telephone number will be Kenwood 5-5100,

Walraven Joins Davies Supply & Mfg. Co.

Burnham G. Walraven has joined the sales engineering staff of Davies Supply & Mfg. Co., St. Louis distributor of plating equipment and manufacturer of plating and anodizing racks.

Walraven, who is now representing the firm in Eastern Missouri, Kentucky and Indiana, formerly was on the en-



Burnham F. Walraven

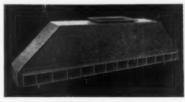


. . . built to specifications . . . save maintenance dollars . . . reduce downtime

■ Wherever corrosive fumes must be handled, complete Agilide (PVC), Agilene (polyethylene) or Agile Prolene (polypropylene-high temperature) systems and components made to fit into your existing systems will do the job at far less cost. Fabricated entirely of rigid and durable thermoplastic, they provide complete protection from corrosion. There are no coatings to chip or peel — no weak spots and no metal parts to corrode.

Agile systems and components cost less . . . are easier to install and have longer service life than other types of installations.

Write for free brochure detailing available components.



Agilene (polyethylene) exhaust hoods can be



Agilene (polyethylene) seamless ducting and duct fittings are available from stock in a variety of



Agilene (polyethylene) centrifugal fans are fabricated completely of plastic in capacities from 185 to 2350 CFM.

AMERICAN AGILE Corp.

5461 DUNHAM RD. . MAPLE HEIGHTS, O.



Acknowledged pioneers in the welding and engineering of structural plastics. gineering staffs of McDonnell Aircraft Corp. and Union Electric Co., St. Louis utility.

After attending the U.S. Naval Academy he served on destroyers during World War II. He later enrolled at the University of Illinois, receiving his degree in Mechanical Engineering. While at Illinois, he was elected to Tau Beta Pi, honorary engineering fraternity.

Apothecaries Hall Division Adds Bridgett to Sales Staff

William E. Bridgett has been added to the sales staff of the Apothecaries Hall Division of Hubbard-Hall Chem. Co. of Waterbury, Conn., according to a recent announcement. He will cover the Southern New England territory, replacing George Colombie in that area.

Mr. Bridgett was formerly in charge of metal finishing for the Stanley-Judd Division of the Stanley Works and has more recently represented Hanson-Van Winkle-Munning in the sale of metal finishing equipment and supplies.

Reassignments Announced by Wyandotte Chemicals Corp.

Wyandotte Chemicals Corp., J. B.

Ford Division, announces the reassignment of three of its sales managers to new locations. W. C. VanKeuren moves from district sales manager, New York, to district sales manager, Los Angeles.

VanKeuren started as a salesman in the Boston district in 1945. In 1952 he was promoted to manager of the Philadelphia district and, in 1957, was named manager of the New York district.

Suceeding VanKeuren as New York

district sales manager is James S. Hubbard, who transfers from a similar position in the Division's Boston office, a post he has held since 1954. Hubbard formerly was sales representative in the Atlanta, Ga., district from 1949 until his promotion to head the Boston area sales activities.

The position of Boston district sales manager was assigned to James L. Ramsey, a former sales department



W. C. VanKeuren

lames S. Hubbard

James L. Ramsey



Formax manufactures a complete line of Buffing and Polishing Compounds in bar, tube and liquid form suitable for all classes of metal, plastic and lacquer finishes. Formax compounds used together with the famous Formax ZIPPO long wearing buffing wheels make a combination that's hard to beat. Our extensive manufacturing, laboratory and testing facilities are always at

Descriptive Catalogs Available on Request

FOUR MCALE

THE NEW MACARR

CURRENT INTERRUPTER

MODEL CIAC

Interrupts voltage to main line starter of rectifier feeding current to plating tank, where interruption is desired. Capable of handling rectifiers with capacity ranges from 500 to 10,000 amps.

TYPE CIDC

Interrupts current using auxiliary DC switch of proper capacity for interruption at bus-bars. Models available from 250 to 1500 amps. DC:

> MODEL CIDC-250 MODEL CIDC-500 MODEL CIDC-1000 MODEL CIDC-1500

Send to Dept. MF for Complete Information

2543 BOSTON ROAD BRONX 67, N. Y.

OLinville 3-3306 - 7

head at the Division's Wyandotte, Mich., offices. Ramsey was a sales representative in Virginia from 1945 to 1951, when he was promoted to managerial duties at Wyandotte.

Du Pont Appoints Nestor

John W. Nestor has been appointed assistant general manager of the Du Pont Co.'s Fabrics and Finishes Dept. Mr. Nestor, manager of the Finishes Division since 1952, succeeds Walter F. H. Mattlage, who became general manager following the retirement of E. S. Nickerson.

Mr. Nestor, who is 52, joined the company in 1927 as a chemist in the paint laboratory at Parlin, N. J. In 1935 he was transferred to what is now the Marshall Research Laboratory in Philadelphia as a research chemist, and two years later became a technical sales engineer in the Chicago region. He was appointed assistant manager of industrial sales in the Chicago region in 1942, and manager in 1944.

Later in the same year Mr. Nestor came to Wilmington on his promotion to assistant manager of industrial sales of the Finishes Division. He was named assistant director of sales in 1945, assistant manager of the division in 1951, and manager of the division in 1952.

News from California

By Fred A. Herr.



Kenneth Baum and Fred Raymond have been named to succeed the late Herald J. Kroesche as joint directors of the plating supply division of Harshaw Chem. Co.'s Southern California oper-

ations. Baum directs the technical phases of the division and Raymond the sales end. Kroesche died at Good Samaritan Hospital in Los Angeles of lung cancer on December 8, 1958.

Don Bedwell and wife Mary plan to take off on a two month tour of Europe on April 23. A plater for 45 years, Don retired two years ago after more than 20 years as plant superintendent and plating foreman of the Hallenschied-McDonald Co., Los Angeles. In the summer of 1957 Don and Mrs. Bedwell toured the South Sea Islands and got in some visits to plating plants in Australia and New Zealand.

This year it's Europe — on a guided tour that will include visits to Belgium, France, Luxemburg, West Germany, Austria, Italy and Monte Carlo. They expect to return to their Inglewood, Calif., home about the end of June.

Ajax Hardware Co. has acquired a tract of land in La Puente, Calif., 15 miles east of downtown Los Angeles as the site for a new manufacturing and metal finishing plant. The firm specializes in the production of building hardware. The general floor area as well as the plating and polishing divisions will be considerably larger than the existing plant at 4351 Valley Blvd., Los Angeles, it is reported.

The Los Angeles County district attorney's office in January warned plating shops, metal working firms, and

New AMPCO® Elastomer- and Rubber-lined Pumps



cut cost of pumping plating solutions

-even those containing HCl!

Pumps are self-insulating.

Save you the extra expense of a special pump made from costly or dangerously fragile alloys.

Eight sizes available from stock through your Ampco Pump Distributor.



DEPT, 239C. MILWAUKEE 46, WISCONSIN
WEST COAST PLANT: BURBANK, CALIFORNIA
SOUTHWEST PLANT: GARLAND (DALLAS COUNTY), TEXAS

WRITE FOR BULLETIN P-6 TODAY! AGATEEN

Lacquer No. 27

- · Crystal-clear, water-white.
- Air-dries hard.
- Produces a smooth, almost invisible film.

A Leader In Its Class!

AGATE LACQUER
MANUFACTURING CO., INC.

SERVING INDUSTRY SINCE 1927

11-13 43rd Road Long Island City, N. Y. Stilwell 4-0660 - 1

AGATEEN THE LAST WORD IN QUALITY

metal spraying operators of a group of alleged gyp artists representing themselves as metal spray experts.

Chief investigator J. R. Blodget of the district attorney's staff reported that the bunco group call on metal spray companies and claim to have a new process that will provide a harder bearing surface than any on the market. They work in two ways. 1. Obtain parts by representing they will apply the extra hard finish and return the items and request the fee. Companies that have been victimized reported that a soft metal had been applied. The group's other technique is to obtain a vital or expensive part of equipment and then demand an additional fee before returning it.

James F. Orr has been named works manager and L. J. Edwards assistant works manager of the Stauffer Chem. Co.'s Henderson Works in Henderson, Nev. Orr succeeded Arthur T. Newell, who retired as works manager in January but continues in an advisory capacity.

The U. S. Steel Corp. has chosen the

San Francisco Bay area as the site of one of eight corrosion test stations for roof-top study of the corrosive effect of the atmosphere on exposed samples of steel.

Specimens of stainless steel and Vitrenamel are set up in racks on the sixteenth floor balcony of a building at 120 Montgomery St. in downtown San Francisco. The location, it is reported, was chosen because of its exposure to San Francisco's varying atmospheric conditions as well as for its accessibility for demonstrating results to builders and architects.

The San Francisco test station is one of three on the Pacific Coast, the others being located in Los Angeles and Seattle. The new program augments a study of corrosion which, since 1929, has included the exposure of more than 30,000 specimens of 350 different types of steel.

John S. Collbran, Jr., formerly western district sales manager in Chicago for the New Jersey Zinc Co., has been transferred to Los Angeles to head the company's new Pacific Coast District which opened offices in Los Angeles on January 1.

Associated Plating Co. suffered an estimated damage of \$50,000 to building, machinery and inventory when fire broke out in its plant at 417 East 16th St., Los Angeles, on January 31. The fire is believed to have been caused by boiling chemicals in a degreasing machine. Gasmasked firemen fought the stubborn blaze for more than an hour.

Eugene Grabbe, technical engineer with the Thompson-Ramo-Wooldridge Corp., Los Angeles, gave members of the Los Angeles Paint & Varnish Production Club some interesting insights into the present status of various engineering fields in Russia in a talk presented at the club's January 14 meeting.

Title of his talk was, "A Look at Automation in the U.S.S.R." He explained he had been a member of an exchange group of 13 Americans which made a 17 day visit to the Soviet Union under auspices of the United States State Department.



BUFFING COMPOUNDS Morthwest METAL CLEANERS Also Made in California H-VW-M PLATING PROCESSES, EQUIPMENT AND SUPPLIES CHECK WITH US FOR YOUR NEEDS

Alert SUPPLY COMPANY

subsidiary of

HANSON-VAN WINKLE-MUNNING CO.
MATAWAN, N. J.

2041 So. Davie Ave., Los Angeles 923 Harrison St., San Francisco RAymond 3-8641 SUtter 1-4563

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

President of Convention Host Branch

Manuel Ben, president of the Detroit Branch, was born in Syracuse, New York on July 29, 1916. After schooling in Syracuse and Utica, he attended the University of Michigan, majoring in chemistry, and received the Bachelor of Science degree in 1939.

He joined General Motors Corp. in 1940, starting as assistant bearing metallurgist at AC Spark Plug Division in Flint, and is now supervisor of the Plating Service Section of the Electrochemistry Department at the General Motors Research Laboratories in Detroit

In 1948 he helped organize, with twelve other men, the formation of the Saginaw Valley Chapter, and became its president in 1953-4. At present Mr. Ben along with being president of the Detroit Branch is also chairman



Manuel Ben

of the Membership Committee. He is also a past president of the Detroit Section of The Electrochemical Society. and is chairman of the 1961 Fall Meet-

Mr. Ben's wife, Evelyn, is active in the Ladies' Auxiliary of the Detroit Branch, and is currently their first vice president.

San Francisco Branch

The regular monthly meeting was

held at the International Inn, South San Francisco, on January 8th. Jack Hite, president, called the meeting to order at 8:30 P.M. A film was presented by the P. G. & E. Co., which showed the construction and the operation of the first atomic powered plant for the production of electricity engineered and financed by private enterprise.

Guy Condrett, chairman of the membership committee, announced that two more applications for membership had been presented to the board of managers and that Ronald Teffs, Harley McQuain and Lee Anderson had been elected to membership.

Trevor Harry, librarian, reported that the speaker for the February meeting would be Joseph Beals of Wallace & Tiernan. The topic, "Waste Disposal Treatment "

Fred Huntington, chairman of the entertainment committee, reported on the success of the Christmas party. Mr. Condrett commented on the high quality of the door prizes and the fact that nearly everyone present received a

The attendance - 18 members and

UNIVERTICAL HIGH PURITY ANODES

ROLLED, FORGED and CAST

Nickel - Copper - Zinc - Tin - Lead Cadmium-White Brass

Have YOU tried "PHOSPHOR-BRITE"?

UNIVERTICAL'S NEW ROLLED COPPER ANODES FOR ACID BATHS!

> The largest automotive impact Bar Platers in the world report a new high in uniformity and performance, along with a better end product.

> OPEN THE DOOR RICHARD! and let yourself in for better than ever acid copper plating.

ELECTRO-BRITE COPPER for CYANIDE BATHS

UNIVERTICAL FOUNDRY AND MACHINE COMPANY 14841 Mayors Rd., BRoodway 3-2000, Detroit 27, Mich.



VIRGIN METALS

USED EXCLUSIVELY



12 guests, and the meeting adjourned at 10:00 P.M.

R. T. Coen Secretary-Treasurer

Baltimore-Washington Branch

The branch will hold its annual meeting at the Statler-Hilton in Washington, D. C., on Saturday, April 11. A technical session with *Dr. William Blum* as chairman will begin at 2:00 P.M. The program is as follows:

1. W. A. Wesley, director of research, International Nickel Co. "Causes and Remedies for the Corrosion of Nickel-Chromium Coatings."
2. John G. Beach, Battelle Memorial Institute. "Plating on Unusual Metals."
3. Abner Brenner, chief, Electrodeposition Section, National Bureau of Standards. "Deposition of Unusual Metals."

The Banquet at 7:00 P.M. will commemorate the 50th anniversary of the organization meeting of the National Electro Platers Association which was held in New York on April 10, 1909. Justus A. Stremel, one of the founding fathers, will be guests of this branch.

The branch will also present the traditional "Pot" to the President of A.E.S. This year it will be gold plated and inscribed A.E.S. Golden Jubilee, Herberth Head, Pres. 1959."

The feature speaker will be Dr. Hugh L. Dryden, deputy administrator, National Aeronautics and Space Administration. His subject will be "Some Problems of the Space Age."

As an added attraction, Washington will hold the Annual Cherry Blossom Festival this year from April 4 through April 12. The coronation of the Queen will be held at the Jefferson Memorial on Sunday, April 12.

All those planning to attend the annual meeting should write to Arthur G. Pierdon, 12 L Street, S.E., Washington 3, D. C., before March 28, 1959. Washington hotels will be very crowded but the Statler Hilton is holding rooms for the guests.

A. G. Pierdon

St. Louis Branch

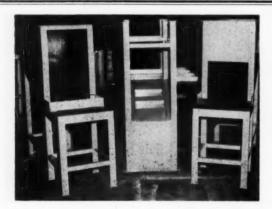
The regular monthly dinner meeting was held on Jan. 14 at the York Hotel with 21 people for dinner. There were 36 present when President William George called the business meeting to order.

John Finney, Eugene S. Weil and Richard H. Bauer of the G. S. Robins & Co. were accepted as new members. A long discussion was held relative to the possibility of having the 1964 convention in St. Louis. The secretary was instructed to send an announcement of our annual Spring banquet to the Midwest Regional before the forthcoming meeting. It was approved by a vote of the members present to extend an invitation to 8 delegates of the Midwest Regional to the banquet.

There was no new business so the meeting was turned over to librarian Arthur Wrisberg, who introduced Roy Gabel, research chemist for Allied Research Corp., who talked about cyanide zinc plating. His talk was illustrated by slides which showed the results of variations in temperature, caustic content and cyanide to metal ratio. After an interesting question and answer period the meeting adjourned with a rising vote of thanks for Mr. Gabel.

The annual Spring Banquet of the branch will be held at the Chase Hotel Starlite Roof, Saturday, May 2nd, 1959.

The branch mourned the passing of one of its older members, *Charles Mc-Ginley*. Charles had served the branch as secretary-treasurer for many years



Your Specials - Our Specialty

Hoppers, for example. STORTS has welded hundreds of them. The designs have been different but characteristics are always the same — trim geometric precision, backed by sound, strong, leakproof welds that are engineered to outlast the construction material. Your special hoppers, tanks, coils, hoods, ducts, etc., will return the most satisfaction and utility if you specify Stortswelding.



38 Stone Street MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification



Chemical polishing cuts finishing costs

Alchemize is the preferred way to finish aluminum with any polish from satin to mirror. It is fast, costs little, needs no electricity—ideal for intricate shapes. See for yourself—we'll process your samples without charge. **Write for complete data.**



CHEMICAL POLISH FOR ALUMINUM

Alchemize Corporation, 625 S. Kolmar at Congress Expressway, Chicago 24, III.

and in recent years often acted as a delegate. He was retired from Wagner Electric Corp. a few years ago, where he had worked as plating room foreman. His passing will represent a great loss to the branch.

Ward Kelly Secretary

Los Angeles Branch

Methods of testing for hydrogen embrittlement was the subject of a talk presented at the January 14 meeting of the branch, by *Matt Carlisle*, head engineer in charge of chemical processing for Northrop Aircraft Co.

Mr. Carlisle is chairman of the A.R.T.C. Project W-95 on hydrogen embrittlement and, during his six years with Northrop, has concerned himself with plating, metal cleaning and finishing, corrosion protection and basic chemical research.

The January 14 business meeting and educational session was attended by 85 members and guests. Among the guests was *Miss Alice Prescott* of the Mefford Chem. Co., Los Angeles, who has been named recording secretary for the arrangements committee for the

1960 A.E.S. convention in Los Angeles.

Lincoln Lowe, Eugene Bates, Minor White, James Schneider and Don Schockley were initiated into membership. In accordance with an action approved last fall, a nomination box was displayed prominently in the meeting hall into which members may drop names of persons they wish to nominate for branch office. The names will be added to those submitted by the regular nomination committee at the election night meeting on March 11.

Larry Henderson, general chairman of the branch's 1959 annual technical session on March 21 reported that three outstanding speakers will appear at the technical sessions in the Beverly-Hilton Hotel from 9:30 to 2 P.M. An outstanding figure in the sports world will speak at the noon-day luncheon, either Buzzie Bavasi, general manager of the Los Angeles Dodgers, or Sid Gilman, coach of the Los Angeles Rams, Henderson announced that 70 tables, seating 10 persons each, will be available for the banquet and ball in the evening. An ice show and a waltz contest will be included in the evening's entertainment program.

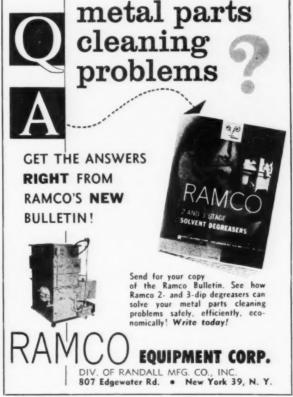
Detroit Branch

Friday evening, January 9th, the branch had a joint meeting with The Electrochemical Society. Vincent Cassiday, of Ford Motor Co., acted as technical chairman. Dr. J. O'M Bockris, of the University of Pennsylvania, spoke on the subject, "The Mechanism of Electrodeposition," A.E.S. Project No. 16. The meeting, held at the Statler Hotel, was well attended. Refreshments were served following the meeting.

The election of six new members brought the total membership to 683. Also announced were three in-transfers: Leslie Hanlon from Cleveland, Otto Klingenmaier from Grand Rapids and W. W. Brodin from Newark. Prior to the meeting, an executive dinner meeting was held. It was attended by executives of the Detroit A.E.S. Branch together with several officers of The Electrochemical Society.

John B. Hitchcock, chairman of the 1959 Stag Day, announced that Stag Day would be held on August 22, 1959. Several locations are being considered but no definite decision has been made yet. Edward J. Kubis, secretary-treas-





urer, reported on a letter received from the Western Ontario Branch inviting the Detroit membership to attend their annual Ladies Night Dinner Dance to be held Friday, January 16th, at the William Pitt Hotel in Chatham, Ontario. Mr. Kubis also reported on the receipt of a letter from H. E. Nice, Detroit branch manager of the Harshaw Chem. Co., which announced the transfer of one of their sustaining members from Chicago to the Detroit Branch.

There were a number of other reports pertaining to local branch events. The executive group meeting adjourned promptly to allow all executives to attend the branch meeting.

R. C. Trees
Chairman—Publicity

Baltimore-Washington Branch

The January meeting was held Tuesday evening, January 13, in the Chemistry Lecture Room at the Bureau of Standard, Washington, D. C.

The meeting was a question and answer session with a panel of experts supplying the answers. The panel consisted of *William Bresnick*, The Martin Co., Baltimore, Md., *Kenneth Huston*, Armco Steel Corp., Baltimore, Md., *Dr.*

Vernon Lamb, Bureau of Standards, Washington, D. C., and Arthur Pierdon, Art Metal Finishing Co., Washington, D. C.

A number of interesting questions and problems were presented by the members and their guests. Clyde L. Rust was introduced to the membership, having recently transferred from the Newark Branch.

Harold W. Scott Secretary

Dayton Branch

Thirty-one members and guests of the branch braved torrential rains on January 21 to greet Dr. Abner Brenner, chief of the Electrodeposition Section, Chemistry Dept., National Bureau of Standards, Washington, D. C. Dr. Brenner gave a brief history of his section and mentioned that this section was originated about 40 years ago by Dr. William Blum. It is now composed of about 20 people and acts as a consulting agency for other bureaus. The problems investigated range from practical to fundamental.

Following his talk, Dr. Brenner showed a series of stereocolor slides

which he took during his visit to Russia last Spring when he attended the Moscow Conference on Corrosion and Protection of Metals.

A social hour followed the meeting during which refreshments were served through the courtesy of the F. B. Stevens Co. and their local representative, *Harry M. Brown*.

L. A. Critchfield Publicity Chairman

New York Branch

The New York Branch held its first meeting of the new year on January 9th, 1959 in the Cornell Room of the Hotel Statler. After the business meeting, Art Carlson, librarian, introduced the speaker, Lou Packman of Platers Research Corp., who discussed "Plating Thickness Measurements." Mr. Packman reviewed the various principles, methods, and equipment used in the measuring of coatings on metals and non-conductors.

The use of a non-destructive thickness tester based on the eddy current principle of measurement evoked an informative discussion. Various members present told of case histories of

MASTERS' ELECTRO-PLATING ASSOCIATION, INC.

CORDIALLY INVITES YOU TO ITS

41st Annual

Banquet and Entertainment

SATURDAY, MAY SIXTEENTH
NINETEEN FIFTY-NINE

THE PLAZA
GRAND BALLROOM
NEW YORK CITY

Reception and Cocktails 6:30 p.m.

Dress Optional

Twenty-Five Dollars Per Person

Reservations may be made by writing to:

MASTERS' ELECTRO-PLATING ASSOCIATION, INC. 59 East 4th Street New York 3, N. Y.

INDUSTRY ... large and small ... relies on RANDOLPH for highly suitable finishes

Lacquers • Synthetic Enamels • Air-Dry Lacquers
Baking Enamels • Wood Lacquers • Texture Enamels
 Aircraft Dopes • Aircraft Enamels

Specialized Production Finishes for exacting requirements in
QUALITY • UNIFORMITY • PROTECTION

ATTRACTIVENESS • ECONOMY

RANDOLPH PRODUCTS COMPANY
CARLSTADT, N. J.

PERIODIC REVERSE and CURRENT INTERRUPTION UNITS



For Plating Copper, Silver, etc. — Alkaline De-rusting and De-scaling — C. I. Copper Plating

Write for information.

UNIT PROCESS ASSEMBLIES, INC.



this type of thickness tester. A considerable interest was voiced in the use of this instrument in rapid testing of anodic coatings on alumium and magnesium.

Anthony P. Briganti Recording Secretary

Buffalo Branch

The Fifth Annual Empire State Regional Meeting will be held Saturday, April 11, at the Hotel Peter Stuyvesant in Buffalo, N. Y. Branches participating in these annual affairs are Rochester, Syracuse, Southern Tier, Capitol District and Mohawk Valley. Frank W. Rudolph, president of the Buffalo Branch, is general chairman of the meeting.

The Educational Session will begin at 2:00 P.M. and will again be divided into 2 sections, a plating section and an organic finishing section. This type of program was initiated at last year's meeting in Rochester and was well received. Two speakers will be featured at each section. Plating Section: I. Laird Newall, president, Henry Souther Engineering Co., whose subject will be "The Role of Stress in the Electro-

deposition of Metals" and Manuel Ben, supervisor, plating service section, General Motors Electrochemistry and Polymers Dept. who will speak on "Hard Chromium Plating." Organic Finishing Section: Fremont L. Scott, research manager, Organic Division, Research and Development Dept., Metal and Thermit Corp., who will speak on "Developments in the Field of Organic Finishing" and Everett W. Linton, sales manager, Duralac Chemical Corp., whose topic will be "Multicolor Enamels."

For the ladies there will be a luncheon at 1:30 P.M. followed by a demonstration of floral arrangements by *Clark Kennedy* of Hodge Florists, who appears weekly on local television.

For evening entertainment there will be a banquet at 7:30 P.M. followed by dancing.

Robert E. Lienert Secretary

Waterbury Branch

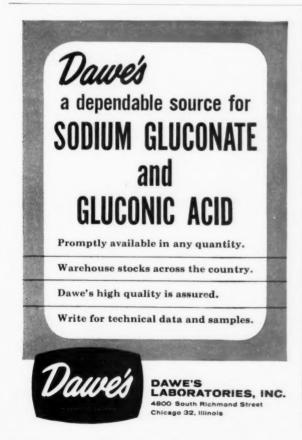
The January meeting was held on January 8 at the Roger Smith Hotel. Representatives of the sustaining members were invited to the meeting to witness the branch in operation and to hear a paper by *Dr. Henry Linford* and *David Feder* on the "Cleaning and Preparation of Metals for Electroplating." The paper covered recent work of A.E.S. Research Project #12 on the effect of oxidized copper on the adhesion of electrodeposits. The paper was well presented and dealt with aspects of plating which are given little consideration. Unpublished data concerning the effect of various known thicknesses of oil deposits were also presented.

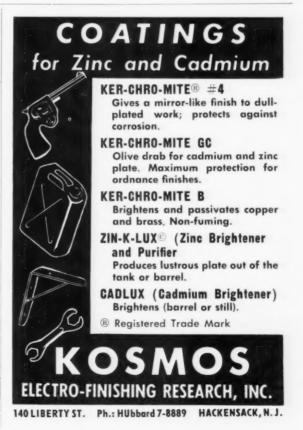
After the meeting refreshments were served. The next meeting will be in March at the Roger Smith. On February 14 the branch will hold its annual Ladies Night with a Valentine's Dance at the Chase Country Club.

F. S. Schneiders

Columbus Branch

The regular monthly meeting was held at Ricardo's Restaurant on Friday, January 9, at 6:00 P.M. The business meeting was called to order by President Harry Moore, and Nate Koslin told of the annual CTC dinner meeting to be held at Winding Hollow Country





Club on Thursday, February 26, 1959.

Librarian Les McGraw introduced the speaker of the evening, Grant E. Miller of Frit Division, Ferro Corp., whose subject was "Use of Porcelain Enamel on Aluminum in Industry." Mr. Miller gave a very interesting talk on porcelain enameling on steel and aluminum.

Following a question and answer session, and a round of applause for the speaker, the meeting was adjourned.

Halvor S. Christianson Secretary

Chicago Branch

The January 9 meeting was a joint one with The Electrochemical Society, held at the Chicago Engineers Club, 314 South Federal St. at 8:00 P.M. A very good turnout of members from both branches were present at the meeting. R. Scott Modjeska introduced the speaker of the evening, Dr. Henry Brown, research director of The Udylite Corp., who spoke on "The Mechanism of Electrodeposition of Bright Metal Plates," illustrated by slides and blackboard sketches.

After a question and answer period, Dr. Brown received a rising vote of thanks for his very informative talk.

Christopher Marzano Publicity Chairman

Milwaukee Branch

The Milwaukee Branch A.E.S. Annual Educational Session and Banquet will be held Saturday, April 25th, at the Hotel Schroeder in Milwaukee, Wisconsin.

The educational session begins at 1:30 P.M. Program is as follows: "Weathering Behavior of Nickel, Chrome, Nickel-Chrome Coatings," by Dr. Andrew Wesley, International Nickel Co., Inc. "The Role of Agitation in Electroplating," by Dr. R. B. Saltonstall, technical director, Udylite Corp. "Emulsion Coatings for Industrial Application," by Alex. Andreoni, technical director, The Glidden Co.

Herman A. Tessmann Publicity Director

Newark Branch

President Gus Bittrich called the January 16th meeting to order with 55 present in spite of a snow storm blowing outside. Don Foulke announced the New York 50th Annual Meeting and urged that a large contingent of Newark Branch members attend the New York Educational session and banquet. Two Christmas cards received by the branch were displayed, one from Ernest Hinterleitner, Newark's most distant continental member and one from Hee Taek Yum of Korea. the most distant member. Three applications were accepted and Norman Lauterette, Jr., a student at Seton Hall University, was elected a member of the branch.

Fred Meyer reported the Christmas Party had been a success and John Banta, chairman of the membership committee, urged that each member bring in new members and outlined steps to take. John also reported that plans for Ladies' Nite in April were well along and urged all to plan to bring a wife or a sweetheart to this meeting.

Paul Santella, a long time member of the branch, was elected first emeritus member under the newly adopted bylaws.

Dr. Foulke reported the sudden passing of V. W. Todd, one of Newark Branch's oldest members, on January 15th. A moment of silence was dedicated to his memory. George Wagner and Mario Di Chiara, under-the-weather Newarkers were reported as on the way to recovery.

Librarian Al Korbelak presented James J. Shyne of Reaction Motors who discussed "Electrophoretic Coatings."

H. E. MacArthur of Conforming Matrix Co. in Toledo discussed "Application of Multicolor Materials Using Permanent Type Masks." By means of a color, talkie film Mr. MacArthur described how electroformed metal masking shields (Ni and Cu) were serving the painting industry.

D. Gardner Foulke

Tri-State Branch

The annual tri-state regional meeting will be held in Louisville, Ky., on Saturday, April 4, 1959 at the Sheraton Hotel.

Registration will be from 10:00 A.M. to 1:00 P.M., followed by the technical program. The speakers will be Dr. Henry Brown, "Mechanism of Electrodeposition with Nickel and Chromium and the Corrosion Resistance of the Deposits"; Eugene L. Combs of Diamond Alkali Co., "Chromium Plating Up To Date"; and James H. Peacock of The Duriron Co., "Metals and Plastics for Handling Plating Solutions."

The banquet will be held at 7:00 P.M., and there will be entertainment and dancing, with favors for the ladies.

Tickets for the banquet and dance are available at \$7.50 per person from J. Muscarella, Chairman, P. O. Box 14, Louisville 18, Ky.

F. L. Lamping Publicity

New York Branch

President E. Saubestre called the "open" meeting of Jan. 23 to order at 8:00 P.M. Fred Denisco, candidate for membership, was accepted by the branch and was duly sworn by the president.

"pH PAPERS"

Accurate pH Values in a few seconds right at the tank.

Indicator AND control-colors on SAME strip. Control-colors in steps of 0.2 pH and 0.3 pH.

Plating ranges (200 strips of a range per box)

Acid:	Alkaline:		
6.0-7.4 pH	6.6- 8.0 pH		
4.8-5.2 pH	7.3- 8.7 pH		
*3.6-5.0 pH	8.6-10.0 pH		
*2.4-3.9 pH	10.1-11.3 pH		
1.0-2.8 pH	10.5-13.0 pH		
0.4-1.4 pH	11.0-13.1 pH		

*Electrometric Values in Nickel Solutions.

Each range is boxed separately.

PAUL FRANK

118 East 28th Street NEW YORK 16 Tel. MU 9-5286 ATTENTION RACK MAKERS!
PURE TITANIUM

BOLTS

NUTS

STUDS

WASHERS
SHIPPED FROM STOCK
Price each in 1,000 lots —

any comb.

100-999 + .05 e				ea. 1-99		10	ea.
Туре	Size	3/4"	1"	11/4"	11/2"	2"	21/2
Hex	10-24	ж	.21	ж	.25	×	×
Head	1/4"-20	.25	.30	.33	.36	.48	×
Bolts 5/	16"-18	×	×	.56	.63	.75	.86
Thumb	1/4"-20	×	.55	ж	ж	×	×
Screws 5	5/16"-18	×	1.10	x	×	×	×
	10-24	×	.10	.11	.12	×	×
Studs	1/4"-20	×	.12	.13	.14	.19	.22
5/	16"-18	×	×	×	.41	.53	.65
A	II ITEMS	SH	IPPED	ERO	A ST	OCK	

ALL ITEM	3 SHIFFEL	LKOW 2	IOCK
Hex Nu	its	Round \	Washers
10-20	.16	3/16"	.06
1/4"-20	.16	1/4"	.06
5/16"-18	.16	5/16"	.10
TITABILITA DA	CK CHIDA	MADE TO	OPPER

Detroit Industrial Process Co. 9301 FRENCH ROAD, DETROIT 13, MICH. WAlnut 1-3800 In a letter received by Milton Nadel, it was disclosed that we have four and not three surviving charter members. Edward W. Feint authored the letter, and it is he who rounds out the four-some. Ed is now a member of the Newark Branch, but says he is too old to attend any of the functions of the A.E.S.

Joe Rembecki, banquet committee chairman, thanked all the members of his committees for their share in preparing for the 50th Anniversary celebration. This affair promises to be the most gala event ever held by the Branch.

Arthur Carlson, librarian, was called on to conduct the "Good & Welfare" portion of the meeting. Artie introduced L. R. Danek of Industrial Filter & Pump Mfg. Co. who described the latest methods of waste disposal in plating rooms. The speaker received a rising vote of thanks, after which the meeting was adjourned.

Anthony P. Briganti Recording Secretary

Indianapolis Branch

Thirty-three members and guests met at Fox's Steak House on January 5, for the monthly meeting. After the introduction of the members and guests, *Paul Johnson*, branch librarian, turned the meeting to *Ed. Bruck*, who acted as moderator of a panel discussion period. The panel members were *W. P.*

Karash of Harshaw Chem. Co., Dr. A. Max of R.C.A., B. E. Hauiesen, Metal Finishing consultant, and A. M. Howard of Steel Protection & Chem. Co. In the hour and a half of discussion, quite a number of questions on metal finishing were discussed. Following the conclusion of the forum, John Hood, branch president, opened the meeting.

Les Reynolds of the Society Membership Committee made a few remarks on the new membership application and the new membership booklets. The problem of selling membership to job platers was discussed. Les then introduced Lee Howald, secretary of the Tri State Region, who made a few remarks on the coming Tri-State in Louisville on April 4th. The general purpose of the Tri State meeting was explained for the benefit of the newer members.

Applications for membership were received from Clive Young and Jerry Stockdale and accepted by acclamation. Two members have been received by transfer. Richard Watson from the Grand Rapids Branch and Richard Brown from the Columbus Branch.

The Secretary reported on a board of managers meeting held December 27, 1958. Discussion at this meeting covered possible recommendations for amendmen's to the Constitution and By-Laws of the Tri State Region and the nomination of *Bert Hawhee* and *Bob Stewart* as candidates for junior representatives of the Tri State. The

election to be held at one of the branch meetings before April.

Ed Bruck reported that Tom Evans, who recently suffered a coronary, is coming along all right.

Flowers from the branch were sent for Roman Bender's father, who passed away on January 3rd. Roman's father had been actively associated with the plating industry for 55 years.

Les Reynolds moved that the branch send a delegate to the Interim Meeting in Atlanta, Georgia, on February 14th. A ballot of the members was taken and delegate Addison Howard was selected to represent the branch.

The meeting adjourned at 10:25 p.m.

A. M. Howard
Secretary

CANADIAN PAINT, VARNISH AND LACQUER ASSOCIATION

The Canadian Paint, Varnish and Lacquer Association has made a grant of \$3,500,00 to the Paint Research Institute of the Federation of Paint and Varnish Production Clubs.

Currently, the institute has nine projects underway at schools in the United States and Canada, These are:

- (1) "Repainting of Chalked Surfaces With Emulsion Paints"—Polytechnic Institute of Brooklyn.
- (2) "Study of Vehicle Films" Case Institute of Technology.
- (3) "Adhesion and Adhesives" University of Louisville,
 - (4) "Film Thickness on Structural





COVERED WITH LIVE RUBBER THROW-AWAY HUB LONGER BELT LIFE

WRITE TODAY FOR INFORMATION.

THE NAZAR RUBBER CO.

Box 316

Toledo 7, Ohio



LAZO — The Pioneer in Lucite Barrel Platers for Better Metal Finishing



LAZO Model 2-BP-6 . . . Single Barrel . . . Motorized . . . Portable

Size: 6"x12" inside cylinder dimen,
Size: Overall: 9"x16"x16" high
3/32" Standard Perforations
Any Type Parts up to 3" dia,
All Plating Solutions
Holds up to 15 lbs.

Designed for easy handling. Light in weight. One lier gear for greater efficiency, with fewer moving arts. Acid and alkall resistant driving gears for plus ssurance against breakdown. Rubber-owered, corroton-free truss rods. No special attachments required adapt these units to present tanks.

Originators of Ribless Plating Barrels

HARDWOOD LINE MFG. CO. 2022 N. Colifornia Ave., Chicago 47, III. Steel" - North Dakota State College.

(5) "Chemistry Related to High Molecular Weight Dioxanes" — Northwestern University.

(6) "Development of a Research Tool to Study Dispersion of Pigments Under Known and Controlled Rates of Shear" — Lehigh University.
 (7) "Subjective Color Experience

(7) "Subjective Color Experience and Color Preferences" — University of Montreal.

(8) "Heats of Solution of Polymers" — University of Montreal.

(9) "Determination of Molecular

(9) "Determination of Molecular Weights" — McGill University.

Progress reports on these studies will be published periodically in the Official Digest under "Proceedings of the Paint Research Institute."

Manufacturers' Literature

Copper Additive

MacDermid Inc., Dept. MF, Water-bury, Conn.

Metex Non-Pitter, a surface-active liquid used to overcome the effects of organic contamination in copper cyanide plating baths, is fully described in Technical Data Sheet No. 83, a two-page usage and instruction sheet.

Thickness Tester

Unit Process Assemblies, Inc., Dept. MF, 61 E. 4th St., New York 3, N. Y.

A set of bulletins describing the Dermitron non-destructive coating thickness tester include excerpts from a paper by Dr. Abner Brenner describing the principles of the instrument. Also included is Bulletin No. 1 de-

scribing the use for the measurement of non-conductive coatings such as anodizing, organic coatings, etc. A specifications sheet describes, in detail, the specifications of the instrument.

Clarifiers and Thickeners

Infilco Inc., Dept. MF, Tucson, Ariz.

New 16-page Bulletin W-800 describes three types of clarifiers and thickeners for handling liquid-solids separation in water, sewage and industrial waste treatment, and includes many detailed variations in installations, both large and small. Three types of skimming mechanism are offered, and typical low, medium, and high torque drives are illustrated.

Dialysis System

Graver Water Conditioning Co., Dept. MF, 216 West 14th St., New York 11, N. Y.

The new Hi-Sep dialysis system is described in Bulletin WC-121, now available. This is the first bulletin issued containing the important facts on the revolutionary dialysis system that can treat acid liquors.

Covered in the bulletin are design, operation, applications and advantages of the dialyzer. Comprehensive engineering drawings illustrate construction and operation. Also discussed are the reasons why the unit provides high-rate separation and large-tonnage recovery.

Any company that uses acid in processing and that now goes through great expense for neutralization or for recovery will find the new dialysis bulletin extremely interesting. It will also be of interest to those having problems with caustic and neutral salt recovery.

Finishing Systems

Industrial Equip. Div., R. C. Mahon Co., Dept. MF, East 3-Mile Road, Detroit 34, Mich.

This new 12-page publication, A-659, features typical custom finishing installations already in operation in automotive, appliance and many other industrial plants.

Besides information on finishing, the publication provides the reader with alternative ideas for improving or building new installations involving drying and baking of all kinds, dust, fume and fog control.

Grinding Wheels

Chicago Wheel & Mfg. Co., Dept. MF, 1101 W. Monroe St., Chicago 7,

A new catalog includes vitrified, resinoid and rubber bonds in cut-off, straight, recessed and plate-mounted grinding wheels. Recommended applications are also given.

Dry Chemical Feeder

Infilco Inc., Dept. MF, Tucson, Ariz.

Bulletin 215 discusses the construction and operation of the company's E feeders. The brochure includes dimensional planographs of all sizes of this equipment for either manual or automatic operation in proportion to flow, pH, etc. Ranges of feed for various chemicals are listed, and a section of general technical data, graphs and useful information completes the bulletin, which is available on request.

Plastic Fans

Atlas Mineral Products Co., Dept. MF, Mertztown, Penna.

Bulletin #9-20 describes rigid plastic

BEAM-KNODEL CO.

METROPOLITAN DISTRIBUTORS
HANSON-VAN WINKLE-MUNNING CO.



COMPLETE SERVICE FOR PLATING AND METAL FINISHING

195 LAFAYETTE STREET NEW YORK 12, N. Y.

CAnal 6-3956 - 7

Zialite

Reg. U. S. Pat. Off.

for NICKEL PLATING

The one bath especially designed for plating DIRECTLY on ZINC, LEAD, ALUMINUM, BRASS, COPPER and IRON.

for HARD CHROMIUM USE Zialite ADDITION AGENTS

Harder CRACK FREE deposits. Increased throwing power. Less sensitivity to sulfate content. Exceptionally fine results plating anything calling for Decorative or Hard Chrome.

ZIALITE CORPORATION

92 GROVE STREET

WORCESTER 5, MASS.

centrifugal fans featuring sizes from $10\frac{1}{2}$ to 35 inches, and Bulletin #9-21 details twin-flow fans available in sizes from 12 to 48 inches.

These fans are made from Ampcoflex Type 1 polyvinyl chloride and offer exceptional chemical resistance with high structural strength in relation to weight.

Rectifier Conversion Kit

Dresser Electric Co., Dept. MF, 2705 Wight St., Detroit 7, Mich.

A complete catalog information on new, silicon conversion kits for plating rectifiers gives kit prices for the popular rectifier models, along with how-toorder information.

Immersion Heaters

N. J. Thermex Co., Inc., Dept. MF, 535-537 Bergen St., Harrison, N. J.

A new illustrated brochure is available on Therm-X-Red immersion heaters. Features of these quartz heaters are given, advantages listed, and a procedure outlined for computing KW requirements.

Pneumatic Temperature Controls

Partlow Corp., Dept. MF, 509 Campion Road, New Hartford, N. Y.

A four-page folder describes a new line of pneumatic temperature controls. The folder introduces the Model RVA, recording pneumatic temperature control, and Model IVA, indicating pneumatic temperature control.

Coated Abrasives

Carborundum Co., Dept. MF, Niagara Falls, N. Y.

A new, practical information kit makes it easier to specify and order coated abrasives. In the kit is a buyer's guide, Form A 1506, with convenient reference tables and forms for listing requirements; a selector chart for metalworking operations, Form A 1507; selector chart for woodworking operations, Form A 1508; a compact brochure, Basics in Coated Abrasives for the Metalworking Trades, Form A 1509; and a brochure, Basics in Coated Abrasives for the Woodworking Trades, Form 1510.

Air Filters

American Air Filter Co., Dept. MF, 215 Central Ave., Louisville 8, Ky.

Bulletin No. 238 describes high efficiency filters, and contains illustrations of media and full assemblies. In addition, filter selection tables, charts of engineering data, and performance curves are included.

Temperature Instruments

Fischer & Porter Co., Dept. MF, 841 Jacksonville Road, Hatboro, Pa.

A line of temperature indicators, controllers and transmitters featuring corrosion-proof fiber glass cases and suitable for temperatures ranging from —400 to +1000F is described in series of five new Specification Sheets 12-1451T-1 to 5.

Nickel Plating

International Nickel Co., Inc., Dept. MF, 67 Wall St., New York 5, N. Y.

A new 24 page illustrated booklet entitled "Practical Answers to 40 Practical Questions About Nickel Plating" was designed to answer, in a nontechnical way, those questions which are most frequently asked of plating specialists. As such, it deals directly with problems of interest to platers, engineers, and equipment designers in almost every field.

The questions and answers included in the booklet pertain to all phases of plating. Some deal with the physical and chemical properties of the coating itself, and with its machining, welding and forming possibilities. Plating techniques and various design factors important to quality plating are also discussed, as well as the many applications in which nickel coating has proved invaluable.

Graphite Heat Exchanger

Falls Industries, Inc., Dept. MF, Aurora Road, Solon, Ohio.

Improved "compression head" design is illustrated, and dimensions, capacities, and operating characteristics are provided for all standard models of the "Cross-Bore," from 21 to 470 sq. ft. of heat transfer surface.

Overhead Conveyors

Chainveyor Corp., Dept. MF, 5618 E. Washington Blvd., Los Angeles 22, Calif.

A new 12-page catalog contains the latest information about low-cost overhead conveyor systems, including typical installations and layouts together with complete engineering specifications.

Thermometer Wells

Thermo Electric Co., Inc., Dept. MF, Saddle Brook, N. J.

A 4-page material guide for over 325 different temperature measuring applications was designed to aid Thermowell users in selecting the proper material for a given application and operating condition. Applications are grouped in chart form according to industry. Recommendations include one or more materials for each application and take into consideration such factors as temperature, contamination, electrolysis, catalytic reaction, solution concentration and other variables. The

THE UNCHALLENGED LEADER IN THEIR FIELD



FREE! SELF-SELLING 20-page catalog includes Schaffner's Buff 'n Polish Calculator, Speed Chart, Illustrations.

Offers Exceptional Opportunity to Industrial Salesmen of High Caliber Representing

BUFFING WHEELS and COMPOUNDS

FIRST CHOICE OF PARTICULAR BUFFERS everywhere—SCHAFFNER'S finest and most complete assortment of Buffing Wheels, that produce a smooth, lustrous finish, superior compounds made of laboratory-controlled materials. New customers of SCHAFFNER are convinced it's the best more they ever made to increased, trouble-free production. For the quality, dependability and efficient service that SCHAFFNER is noted for.

SCHAFFNER MFG. CO.

NEW SCHAFFNER BIAS BUFFS PROVE A BIG SUCCESS, a territic seller! Exclusive, new features give more mileage, longer life! YOUR MARKET IS ENORMOUS—woodworking and netalworking shops, factories, rebuilders, lewelry manufacturers—SCHAFF-NER is the answer to all buffing and polishand with excellent commissions, heavy repeat orders, Write TODAY for complete details, FREE CATALOG, and preferred territors.

Dept. M-5, 21 Herron Ave., Pittsburgh, Pa.



chart is punched for use in a three-ring binder. It is printed in two colors on heavy stock and is also suitable for wall mounting.

Organic Coatings

Carboline Co., Dept. MF, 32 Hanley Industrial Court, St. Louis 17, Mo.

Bulletin 100 gives a breakdown of the four classifications of corrosive conditions according to severity of exposure. Sketches of appropriate areas are shown in each grouping.

A simplified chart enables selection of coatings according to service requirements. Physical properties as well as chemical resistance are shown in easy to read columns. Examples of typical recommendations serve as a guide to an understanding of generic types and standard products.

Plastic Valves

Vanton Pump & Equip. Corp., Dept. MF, Hillside, N. J.

A four page chemical resistance data sheet lists alphabetically the chemical resistance of the plastic and synthetic rubber materials of construction of the above manufacturer's plastic Flex-plug gate valves to 256 corrosive fluids, with corresponding temperature and concentration data.

Rotary Pumps

Deming Co., Dept. MF, Salem, Ohio.

Bulletin No. 1535 covers generalpurpose, industrial, internal gear rotary pumps, presenting a discussion of how the pump works and how it is constructed. A complete list of applications also appears. Capacities, r.p.m. tables, and construction materials are covered in easy-to-read form.

One complete page of the informative, four-page bulletin illustrates eight of the various types of pumps and gives a short resume about the operation of each pump. A complete dimension table with diagrams appears on the back page.

Spray Painting Equipment

Gray Co., Inc., Dept. MF, 1027 Sibley St., N.E., Minneapolis 13, Minn.

A new catalog features the latest spray painting equipment, including cup guns, Redi-Sprays (for spraying multi-color paints, enamels, etc., direct from original 1-5 gallon shipping pails), direct supply spray units, circulating paint systems and the Graco Hydra-Spray (for spraying paints without the use of atomizing air). In addition, there is a complete selection of spray painting accessories and hose.

Chromium Plating Services

Whyco Chromium Co., Inc., Dept. MF, U. S. Route 8, Thomaston, Conn.

A series of newly available information bulletins on barrel and rack chromium plating includes one of the firm's services and facilities; and technical progress reports called "Whyco News"

Also included are illustrations and descriptions of the firm's services for burnishing, testing, laboratory work and research.

Rotary Pump

The Deming Co., Dept. MF, Salem, Ohio.

Bulletin No. 1550 presents typical application data, specifications including rotor, pump casing and head, bearings, bearing housing, axial rotor adjustment, stuffing box, and shaft specifications on a new line of heavy-duty internal gear rotary pumps.

Also covered are features of construction and operation plus an operating conditions table. An installation diagram is also included in the new bulletin. OBITUARY

DR. LEE B. STORMS



Dr. Lee B. Storms, 42, director of research at Red Spot Paint & Varnish Co., died in Cairo, Ill. recently. A native of Evansville, he joined the company in 1936 and had been with the firm since that time.

Dr. Storms attended Evansville College and the University of Vermont before going to Indiana University, where he received his bachelor's degree in 1936. He also earned his master's and doctor's degrees in philosophy from Indiana University.

He was a member and elder of East Side Christian Church, Evansville Country Club, Evansville Scientific Club and Rotary. He also was a member of the American Chemical Society, treasurer of the Society of Vacuum Coaters and director of the Evansville Association for the Blind.

Surviving are his wife, *Elinor*; a son, *Charles Dirk*, at home; and his mother, *Mrs. Milton Z. Thorson*, of Evansville.

ADVANCE!

"Your course was very good and quite thorough and as a result I have reached the position of plant superintendent. Thanks!" writes former plater, Ed Osborne of Evanston, Illinois. Why not let this truly unique home study course, ELECTROPLATING KNOW HOW, help you advance? Write Dr. Joseph B. Kushner, Electroplating School, Box 2066, Evansville 14, Indiana.

HAMILTON MILLS



For color and lustre beyond compare, specify INDIAN BRAND TURKISH EMERY. Preferred by those who know the best. Also available — HECCO BRAND AMER-ICAN EMERY, for use in abrasive pastos and compositions.

HAMILTON EMERY & CORUNDUM CO. CHESTER, MASS.

SOMMERS BROS. MFG. CO.

MFRS. OF "BEACON"

Plating and Polishing Supplies and Equipment—Complete Semi and Full Automatic Installations—Gold, Silver and Chrome Rouge, Stainess Steel and Satin Finish Compounds—Buffs, Polishing and Felt Wheels.

3439 NO. BROADWAY ST. LOUIS 7, MO.

Per column inch per insertion 1 time - - - \$12.00 3 times - - - 11.00 6 times - - - 10.00 6 times - - 10.00 Yearly (12 times) 9.00

READY REFERENCE SECTION

POLISHING AND BUFFING ELECTROFORMING ANODIZING RUSTPROOFING . PLATING . VACUUM METALIZING . LACQUERING AND ENAMELING

BARREL FINISHING

· SPECIAL · **OFFERINGS**

Money Saving Prices **Immediate Delivery**

- 50-Assorted Plating Barrel Units, Standard Makes for all solu-
- 50-Various Sizes Heat Exchangers, Stainless, Lead, Carbate, Steel. All sizes, with pump units.
- -Assorted full automatic rotary Buffing, Polishing & Deburring Machines, Divine, Hammond, Packer, Acme, etc. tables from 20" to 72" diameter, with 3, 4, 5 and 6 heads.
- -Assorted plating rheostats, double pole reversing switches, from 10 amp. up to 5000 amps.
- 30-Semi-Automatic single to eight
- spindle machines, Hammond, Acme, Divine, Automatic, etc. 300—Assorted buffing and polishing ma-chines from 1 HP to 50 HP single and double end spindles, including some variable speed types.
- 300—Assorted size wood, steel, rubber, plastic, lead lined and stainless tanks up to 30 ft. long.

BUY OF THE MONTH

- 100—Sturgis, Roto Finish, Baird, Crown, Belke, Abbott, Henderson and other makes of tumbling, cleaning and burnishing barrels.
- 1-HVWM 4 Station Plating Unit 36 x 14 Cylinder — for nickel & cyanide. -HVWM 6 Station Plating Unit, all
- tanks for cleaning cycle.
- 10—Semi automatic plating machines, 10 ft. to 35 ft. long for nickel, copper and chrome.
- -Industrial Filters, RDR-2, 36 x 3630, for nickel, complete.
- 100-Various sizes rectifiers from 25 amp. to 5000 amps. Selenium, Germanium, all complete with controls.
 90—Various size Generator sets from 50
- to 10,000 amps, Chandeysson, Hanson Van Winkle Munning, Bogue and other standard makes, all complete with panel boards, starters, etc. voltage range 2 volts up to 100 volts, for all purposes.
- STagg 2-2022

J. HOLLAND & SONS. INC.

489 KEAP ST. . BROOKLYN 11, N. Y.

USED.. NOT ABUSED EQUIPMENT

ALL OF THE EQUIPMENT LISTED BELOW IS FULLY RECONDITIONED AND GUARANTEED IN STOCK

POWER EQUIPMENT

- 1-H-VW-M Mtr. Gen. 750/A-8 V.
- 1-American Giant 750 amps. 6 volts
- 3—Udylite rectifiers 1500/750 amp. 6/12 V. 2—R-A 500 amp., 6 V. with control.
- -G. E. 500 amps. 6 volts with control.
- Rapid 300 amps. 6 volts with control.
- -Udylite 500 amps. 6 volts with control.

SEMI-AUTOMATIC PLATING MACHINES

5-From 12' to 32' long for nickel and cy-

PLATING BARRELS

- 2-Daniels #3.
- 3—Lasalco steel 36 x 18 Lucite cylinder.
- 1-Lasalco rubber lined 30 x 15.
- 1-H-VW-M steel 36 x 18.
- 1-Udylite steel-42 x 15.
- 2—Udylite multi-purpose barrel hard rubber cylinder.

10—Industrial, Alsop, Sethco — all sizes nickel and cyanide solutions.

TUMBLING BARRELS

- -Abbott barrels, variable speeds.
- #2H Baird poliaction Tumbler.
- 10-Baird barrels 2C tilting type.
- 8-Henderson barrels 5A tilting type.
- 4-Globe barrels

POLISHING MACHINES

- 1-Production Machine #101 71/2 H.P.
- 4-#101 Tandum 15 H.P.
- 2-Production Machine #484-2.
- -Acme A2
- Acme B10
- 2-Divine Model VM-10 10 H.P. 2-L'Hommedieu 5 H.P. variable speed.
- 15-Holland 5 H.P. 71/2 H.P. 10 H.P.
- 1-Acme L-82 71/2 H.P.
- 4-Gardener 5 H.P. 71/2 H.P.
- 6-Divine Idlers.

DRYFRS

- 1-Ronei R100
- 2-Barrett centrifugal dryers.
- 2—Kreider #12 steam explosionproof mtrs.

Kane gas fired 20 H.P., 71/2 H.P.

RHEOSTATS - all sizes

MISCELLANEOUS

- 1-Detrex alkaline belt washer.
- Philips electric degreaser.
- -Blakeslee pump type washer.
- Blowers and motors-multivain (fume) ped-
- dle wheel (dust).
- 1-Blakslee washer.

TANKS

300-All sizes - all linings.

COMPLETE PLANTS PURCHASED -SURPLUS EQUIPMENT WANTED.

LINDALE

EQUIPMENT AND SUPPLY CORP.

504 SMITH ST., BROOKLYN 31, N. Y. Phone: TRiangle 5-4353

Save More SHIPMENT!

Select from one of the nation's largest stocks of guaranteed rebuilt electroplating motor generator sets and rectifiers with full control equipment.

- -8000/4000 AMPERE, 6/12 VOLT. CHANDEYSSON, Synch. -7500/3750 AMPERE 9/18 VOLT. H-VW-M, Synch. -7500/3750 AMPERE, 6/12 VOLT.
- M-VW-M, Synch. -7500/3750 AMPERE. 6/12 VOLT, 25°C. CHANDEYSSON, Synch. -6000/3000 AMPERE. 6/12 VOLT. ELECTRIC PRODUCTS, Synch. -5000/2500 AMPERE, 12/24 VOLT.
- 5000/2500 AMPERE, 12/24 VOLT. CHANDEYSSON, Synch. 5000/2500 AMP., 9/18 V., 25°C., CHANDEYSSON, Synch. Exciter-in

- 5000/2500 AMPERE 6/12 VOLT,
 55°C CHANDEYSSON, Synch.
 4000/2000 AMPERE 6/12 VOLT.
 H-VM-M, Synch. Exc.-in-head.
 50000/1000 AMPERE 7/24 VOLT.
 CHANDEYSSON, Exciter-in-head.
 5000/1000 AMPERE 6/12 VOLT.
 5000/1000 AMPERE 6/12 VOLT.
- NING. 1500/750 AMPERE, 12/24 VOLT. CHANDEYSSON, Synchronous.

ANODIZERS

- ANODIZERS

 -1000 AMPERE, 40 VOLT. CHANDEYSSON, 25°C.
 -1000 AMPERE, 30 VOLT. IDEAL,
 Exciter-in-head,
 750 ALBERGA.
- Exciter-in-head.
 750 AMPERE, 60 VOLT. HANSON-VAN WINKLE-MUNNING, Syn-
- VAN WINKLE-MUNICIPACITY CHAN-chronous, Exciter-in-head. 500 AMPERE, 25 VOLT. CHAN-DEYSSON, Synchronous, Exciter-in-
- head. 400 AMPERE, 40 VOLT. M.G.C., Separately Excited.

RECTIFIERS

- NEW G. E. 1000/500 AMPS. 6/12 VOLTS, Remote Control, 440/3/60
- 1-NEW G. E. 1500/750 AMPS. 6/12 VOLTS. Remote Control, 220/3/60
- NEW G. E. 2000/1000 AMPS. 6/12 VOLTS, Remote Control, 440/3/60 AC.
 - SPECIAL
- 2—CROWN & H-VW-M Centrifugal Driers No. 1 and No. 2 with Heat. 3—LA SALCO Ball Burnishing Barrels.

- Sizes 1, 2 G 4.

 3-L'HOMMEDIEU Twin and Single 5
 H.P. Variable Speed Buffers.
 2-RANSONOFF & COLT Gas-heated
 Hot-air Spiral Dryers.
 2-ACME LBL Automatic Buffer and
 ACME B-10 Semi-automatic Comb.
 2-INDUSTRIAL Type SC Filters for
 Cyanide. 18x48 and 18x36.
 4-No. 2H BAIRD Polication Tumblers.
 1929-1959 30 Years of Service.

E. BAKER CO.

Kirkland 7-5460 25 Wheeler St., Cambridge 38, Mass.

Per column inch per insertion

1 time - - - \$12.00 3 times - - -11.00 10.00

Yearly (12 times)

9.00

READY REFERENCE SECTION

POLISHING AND BUFFING RUSTPROOFING . PLATING ANODIZING

BARREL FINISHING

METALIZING . LACQUERING AND ENAMELING VACUUM

IN STOCK

WAREHOUSE CLEARANCE - BUY AS IS IN OPERATING CONDITION OR REBUILT GUARANTEED

AUTOMATIC POLISHING EQUIPMENT

AUTOMATIC POLISHING EQUIPMENT

- Udylite 76: Return Type Extrusion Polisher w/
7-10 H.P. & 3/5 H.P. Heads.
2-Acme L.-8-L. with 3 Heads.
1-Packermatic 60' Table 12 Spindles 7 Heads.
1-Packermatic 60' Table 12 Spindles.
1-Acme 10' 8 Spindles 5 Spindles.
1-Hammond 30' Reciprocating Table.
1-4-Acme 61' 8 Spindles 7 Table.
11-Acme 6-3 144" Belt Sanders.
3-Acme 6-1 Universal 5-15 H. Heads 15 H.P.
3-Morray Way 35 & 60 Series Heads & Sanders.

SEMI-AUTOMATICS

I-Acme E-10 With or Without A-2 Head. I-Acme E-10 With 45 degree angle flat polishing

attachment.

-Acome A-2:

-Acome A-2:

-Automatic Machine Co. 4 Spindle—Like New.

-Automatic Machine Co. 8 Spindle.

-Divine 2 Spindle.

-Divine 2 Spindle for out of round work.

-Divine 1 Spindle for out of the control of the con

Attachment.
Automatic Machine Co. Single Spindle with 6"
Oscillation.
Replacement Parts for all Above Machines in stock.

stock.

Large Stock of Chucks & Special Attachments & Work Holders.

RECTIFIERS

i-18 Volts, 5000 Amperes Rapid, New Selenium Stacks, Remote Control, I-48,724 Volts, 2000 /4000 Amperes Rapid, New Selenium Stacks, W /Control, I-48,724 Volts, 1000, 2000 Amperes Rapid, W/Con-

-12/6 Volts, 1000/2000 Amperes G. E. -G. E. Automatic Voltage Controller, 6000 Amp-

/6 Volts, 750/1500 Amperes Udylite, W/Con-

9—12/6 Volts, 750/1500 Amperes Udylite, W/Controls.

New Replacement Stacks for Udylite \$285.00.

1—Udylite Confrol for 5000 Amperes.

1—6 Volts, 1000 Amperes Lewis, W/Control.

1—6 Volts, 1000 Amperes Green, W/Control.

2 phase.

2 phase.

2 to Amperes Rapid, W/Controls.

4—6 Volts, 500 Amperes. Rapid, Green, Lewis,

Udylite, W/Controls.

10—6 Volts, 500 Amperes. New G. E. Copper Oxide.

Replace your burnt out Copper Oxide Stacks \$175.00
for Stack & Kit.

10—New G. E. Controls.

1—6. Volts, 500 Amperes.

3—6 Volts, 500 Amperes.

3—6 Volts, 500 Amperes.

Volts.
12—6 Volts 500 Amperes G.E. W/New Setentum.
Stacks.
6—6 Volts. 300 Amperes G.E. W/New Setentum.
Stacks. & Control.
2—12 Volt, 256 Amperes G.E. W/Control.
1—85.74 Volts. 150 300 Amperes Green W. Control.
2—6 Volts 100 Amperes W. Controls.
2—6 Volts 100 Amperes W. Controls.
2—6 Volts to 15 Volts. 50 Amperes, W. Controls.
2—6 Volts to 15 Volts. 52 Amperes, W. Controls.

MISCELLANEOUS

MISCELLANEOUS

Udylite Jr. Automatic Plating Machine (Zinc). Industrial Filter 3'x5' RDR-2 w sturry tank.

20' semi-automatic rubber lined tank—wari-speed. Hammond DD-9 w/10 H.P. motor.

3—Production 101 w/10 er 15 H.P. motor.

3—Production 101 w/10 er 15 H.P. motor.

4—Hammond double 7'½ H.P. Pol. Mach. like new, ward of the standard of the standa

tank. Acme Straight Lire Buffing Conveyor, oval shaped approx. 30' w/Comming Devices.

POLISHING ACCESSORIES

Spindles, Nuts, Washers, Spacers, Wrenches, Spin-ners in Stock.

Plating, Polishing, Grinding, Spraying, Baking, Drying, Tumbling, Cleaning, Degreasing & Anodizing Equipment. Anodes, Chemicals, Acids, Cyanides, Salvents, Supplies for Wood, Plastic and Metals.

Pesco Plating Equipment Corp.

75 Wythe Ave. Brooklyn 11, New York EVergreen 4-7472 - 3 - 4

BETTER BUYS

BETTER EQUIPMENT

Generator Power Available From 30¢ per Amp. and up

1-8/16 Volt-20,000 Amps.

1- 11 Volt-10,000 Amps.

6 Volt-10,000 Amps. 12 Volt- 7,500 Amps. 2_

9 Volt- 7,500 Amps.

6 Volt- 6,000 Amps. 1-8 Volt- 3,000 Amps. 2-

6 Volt- 3,000 Amps.

1-6/12 Volt- 1,500 Amps. 1-9/18 Volt- 1,500 Amps.

Rectifiers

6-12/24 Volt-1,500 Amps.-late model Udylites.

6-18x48x40 Type SCW-2-Industrials.

3-36x36x30 Type SCW-2-Industrials

2-36x36x30 Type RDR-2-Industrials.

2-Portable Filters.

1-20 ton refrigeration - Frigidgire.

3-2 ton chillers.

All sizes - rubber and Koroseal lined tanks.

All sizes - steel tanks.

Rheostats - 200 Amp. and up. Hanson-Van Winkle-Munning -Columbia

PLATING SERVICE AND EQUIPMENT CORP.

3620 Hart St. Detroit 14. Mich. Phone: Valley 3-1852

PLATING GENERATORS FOR SALE

10000/5000 Amp., 18/36 Volt, Chandeysson MG Set, Direct Connected Exciter, Panel and Starter (1947 Machine), 300 RPM, Like New.

8000/4000 Amp., 18/36 Volt Chandeysson MG Set, Lirect Connected Exciter, Panel and Starter (1946 Machine), 300 RPM, Equal To New.

10000/5000 Amp., 6/12 Volt Chandeysson MG Sets, Direct Connected Exciters, Panels and Start-ers (1948 Machines), Like New.

10000/5000 Amp., 9/18 Volt Chandeysson MG Set. Direct Connected Exciter, Panel and Starter (1952 Machine), Like New, 2000 Amp. 50 Volt Chandeysson, 25 Deg. Ano-dizer, Direct Connected Exciter, Panel and Start-er (1954 Machine), Like New.

We have several of the above machines located in Midwest. Priced Right, Available immediately.

ALAN BAKER COMPANY

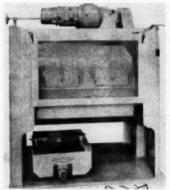
180 Sylvester Road South San Francisco, Calif. Plaza 5-6506

REBUILT PRODUCTION BARREL FINISHING EQUIPMENT MUST BE SOLD!

1



ROTO-FINISH Model CW 45-2 Two 19" x 32" I.D. Compartments 3 H.P. Constant Speed Price: \$800.00 each



STURGIS Model BW 45-2 Two 19" x 32" I.D. Compartments 3 H.P. Variable Speed Price: \$1200.00 each

Model BW 603 Three 19" x 32" I.D. Compartments 3 H.P. Variable Speed Price: \$1400.00 each

CLINTON SUPPLY COMPANY

112 So. Clinton St. Chicago 6, Illinois Franklin 2-3538 ~ TELEPHONE COLLECT

Per column inch per insertion \$12.00

3 times -11.00 10.00 6 times -Yearly (12 times) 9.00

REFERENCE SECTION

ANODIZING RUSTPROOFING . PLATING

BARREL FINISHING

VACUUM METALIZING . LACQUERING AND ENAMELING

PLATERS AND ANODIZERS

M.G SE	IS - Motor	3-60-220/440
Amp.	Volt	Make
100	80/90	Reliance
125	40	Star
175	14	Delco
200	71/2	Chandeysson
200	65	G. E.
200	71/2	Hobart
300	71/2	Hobart
400	60/60	G. E.
400	6	H-V-W
500	60	Westinghouse
750 (Twin)	6	H-V-W
750/375	6/12	Excell-All
940	32	Elec. Prod.
1000/500	6/12	Chandeysson
1500	15	Star
1500	30/50	Century
1500	40/65	G. E.
1500	65	Westinghouse
1500	70	Century
2500/1250	6/12	Elec. Prod.
5000/2500	6/12	Columbia
5000/2500	9/18	Chandeysson
7500	9	Elec. Prod.
	SHUNT	S

5.000 Amp., 50 mv. 6.000 Amp., 50 mv. 10,000 Amp., 50 mv.

15,000 Amp., 50 mv.

MOTOR REPAIR & MANUFACTURING CO.
1555 HAMILTON AVE., CLEVELAND, OHIO

OVEN FOR SALE

Despatch RS-3 Gas-Fired Inside Dimensions 4' x 4' x 6' High Safety Controls 115 V A.C. — Safety Doors Operating Temperature 450° F. Forced Exhaust, Used for Plastisol Coatings

RESOLITE CO. 1330 Cranston St. Cranston, R. I.

Clearance of Latest Type Polishers-**Buffing Lathes, etc.**

4 Acme G-1-10 H.P.-\$400.00 each,

13 Murray Way-10 H.P.-\$375.00 ea.

21 Murray Way-15 H.P.-\$400.00 ea. All totally enclosed fan cooled 220/440/3/60 motors.

5% discount if 10 or more ordered.

15 Miscellaneous buffing lathes \$225.00 each.

1 Standard variable speed buffing lathe - \$585.00.

2 Udvlite Mallory 1500/750 Amp. plating rectifiers 230/460 V. 6/12 A. 3 phase, 60 cycle, model UM1500B. Serial Nos. 111551 and 111557.

All machines in excellent condition as removed from service.

The Mackenzie Machinery Company 173 Second Street Cambridge 42, Mass. **ELiot 4-7668**

FOR SALE

Packer-Matic rotary polisher — Model 2-12 complete with 4-7½ H.P. Heads in perfect condition. Can be seen in operation. Cost \$12,000, new in 1952. Sell reasonable. Address: January 2, care Metal Finishing, 381 Broadway, Westwood, N. J.

AUTOMATIC FOR SALE

Udylite full automatic conveyor 9' wide x 35' long 100 racks per hour. Used for dichromating, can be changed for plating cycle very easily. Sell reasonable. Address: January 3, care Metal Finishing, 381 Broadway, Westwood, N. J.



IDEAL TACK RAGS

For a Perfect Finish Bulk or Bagged IDEAL CHEMICAL COMPANY 1499 Dean Drive So. Euclid 21, Ohio EV 1-4111 - EV 2-1111

WANT TO BUY

Industrial Filter Rubber Lined for Nickel Solution, 36 x 36 or larger, Address: March 1, care Metal Finishing, 381 Broadway, Westwood, N. I.

EQUIPMENT FOR SALE

- 1—New 50' H-VW-M automatic, 50" lift, adaptable to zinc, nickel, phosphate or anodize cycle. Complete including a 9 volt 20,000 Amp. generator. 35% of new cost.
- -Hill Acme sheet polishers. Good buy. 6-Generators, 7,500 to 20,000 Amps.
- 1-New Sparkler filter, 10,000 gph. 50% off.
- 2-Sperry filter presses, size 30, type 41. 1—Hammond automatic 6 station table, 4 lathes 5 HP. Mod. 50-81. Like new.
- -Acme automatic table, 4 floating heads, 3 HP. New condition.

RELIABLE INDUSTRIAL EQUIPMENT CO. 633 Richmond St. Grand Rapids 4, Mich. Riverside 2-2607

PROBLEMS

AUTOMATICS

- A. Too costly.
- B. Products too diversified in shape.
- C. Not enough production to warrant expenditure.
- D. More than one plating finish required.

ANSWER

Automatic Cleaning & Pickling Transfer Unit to save on labor, uniform cleaning, and cut rejects, which in 90% of cases originate in precleaning.

AVAILABLE

Belke Transfer Machine, 7-12 station, including cleaning, pickling and also if required, strike solution. Overall dim.: 30' x 11' x 11' wide. Tank depth 42". Can be seen operating. Automatic dwell mechanism 10 seconds to 20 minutes. Will feed as many as 4 and 5 still or semi-automatic plating units. No cost whatever in changing cycle to fit any requirements.

> WIRE - PHONE ANdrews 8-3640

WE HAVE ONE OF THE LARGEST AND MOST VARIED STOCKS OF METAL FINISHING EQUIPMENT IN THE COUNTRY

Send for our Equipment Listings WE ALSO PURCHASE USED AND SURPLUS EQUIPMENT

BAKER BROS., INC.

564 EAST FIRST ST.

SOUTH BOSTON 27, MASS.

ANdrew 8-3640

Per column inch per insertion \$12.00 3 times -11.00

Yearly (12 times)

10.00

9 00

ANODIZING

POLISHING AND BUFFING RUSTPROOFING . PLATING

READY REFERENCE SECTION

ELECTROFORMING BARREL FINISHING

VACUUM METALIZING . LACQUERING AND ENAMELING

BETTER BUYS

BETTER EQUIPMENT

- 1-Udylite return type fully automatic horizontal zinc or cadmium plating machine - 16-36 cylinders - bright and dichromate. Can be skipped or delayed.
- 1-Hanson-Van Winkle-Munning -two lane 64 inch lift. Adapted for copper-nickel and
- 1-Hanson-Van Winkle-Munning -Two lane - 36 inch lift. For cadmium or zinc.
- 1-Hanson-Van Winkle-Munning -Single lane - 36 inch lift. For cadmium or zinc. Can be adapted for nickel and brass.
- 1-Stevens automatic barrel plater, model C - 31 barrels. Can be redesigned for any cycle.
- 1-Semi-automatic nickel plater.
- 2-Semi-automatics for copper, cadmium or zinc.

Mercil plating barrels - complete with tanks and gear drives.

Ransohoff spiral dryers - steam or gas fired.

PLATING SERVICE AND EQUIPMENT CORP.

3620 Hart St. Detroit 14, Mich. Phone: Valley 3-1852



WORTHY STRAINER

STRAINS PAINTS AND VARNISHES AS YOU SPRAY

Consult Your Paint Degler or Order Direct From Factory in Lots of 12

Price \$1.50 Ea WORTHY PRODUCTS CO. Temple, Pa. Box 123

Send For Literature

PARTIAL LIST OF REBUILT EQUIPMENT WITH A NEW GUARANTEE

WITH A NEW GUARANTEE

POWER

HVWM 10000/5000 ampere 6/12 volts 300 RPM 100 HP Synchronous.

HVWM 7500/3750 Ampere 6/12 volts 300 RPM 75 HP Synchronous.

RAPID 6000 Ampere 6 volt remote control.

OPTIMUS 5000/2500 Ampere 6/12 volts 600 RPM 50 HP GE Motor.

UDYLITE 1500/750 ampere 12/24 volts remote control.

CHANDEYSSON—2500/1250 ampere 6/12 volts 720 RPM Synchronous.

ELECTRIC PRODUCTS 2500/1250 7/14 volts 720 RPM Synchronous.

RICHARDSON ALLEN—1000 ampere 6 volt self contained.

RAPID 1500 ampere 6 volt self contained.

HVWM 1000/500 ampere 6 volt self contained.

HVWM 1000/500 ampere 6 volt self contained.

HVWM 14 ft. x 4 ft. x 3 ft. cyonide.

HVWM 16 ft. x 5 ft. x 3 ft. cyonide.

HVWM 20 ft. x 4 ft. x 3 ft. cyonide.

HVWM 20 ft. x 4 ft. x 3 ft. cyonide.

HVWM 21 ft. x 4 ft. x 3 ft. cyonide.

HVWM 21 ft. x 4 ft. x 3 ft. cyonide.

HVWM 21 ft. x 4 ft. x 3 ft. cyonide.

HVWM 21 ft. x 4 ft. x 3 ft. cyonide.

HVWM 21 ft. x 4 ft. x 3 ft. cyonide.

HVWM 21 ft. x 4 ft. x 3 ft. cyonide.

HVWM 21 ft. x 4 ft. x 3 ft. cyonide.

HVWM 20 ft. x 5 ft. x 4 ft. nickel.

UDYLITE 20 ft. x 5 ft. x 4 ft. nickel.

UDYLITE 30 ft. x 5 ft. x 4 ft. nickel.

UDYLITE 30 ft. x 5 ft. x 4 ft. nickel.

UDYLITE 30 ft. x 5 ft. x 4 ft. nickel.

UDYLITE 30 ft. x 5 ft. x 4 ft. nickel.

HVWM 20 ft. x 4 ft. x 3 ft. cyonide.

U. S. Electrical Tool 5 H.P. Polishing Machines Variable Speed.

HAMMOND 7\(\frac{1}{2}\) H.P. Model RO.

CROWN Plating Barrels — Lucite Cylinders.

Phillips Vapar Degreasers with spray.

8 ft. Korseal Lined Chrome Tank complete with hood, etc.

Henderson Bros. Tilting Tumblers.

Industrial Filter 18×4840 RDR-2 — others.

TANKS — ALL SIZES AND LININGS rbuffs — Compounds — Anodes — Chemicals, a rbuffs — Compounds — Anodes — Chemicals For Quality, Dependability & Service call on: Airbuffs -

BRUCAR EQUIPMENT & SUPPLY CO. INC.

604 - 20th STREET

Telephone: TRiangle 1-4100-1-2

BROOKLYN 18, N. Y.

SOLVENTS & THINNERS RECOVERED

from

SLUDGE . WASTE . WASH . SPOILED LACQUERS, Etc.

HAMMOND SOLVENTS RECOVERY SERVICE

241 Brunswick St. Hammond, Ind. Phone: Sheffield 5241

FOR SALE

UDYLITE FULL AUTOMATIC

Private sale of completely reconditioned fully automatic plating unit with hydraulic lift. Excellent condition.

BLAKESLEE SPIRAL DRYER

Blakeslee single stage conveyor dryer 22' long, capable of drying a 14 x 36 plating barrel every minute.

ALUMINUM ANODIZING CORP. 89 Bickford St. Jamaica Plain, Mass. JAmaica 2-2550

RANSOHOFF TUMBLING MILLS

48" diameter x 84" length end loading and unloading. Automatic media separation. 11 cubic foot power loader with hoist. NEW - Government surplus. Sold at 50% of replacement cost.

MILT GROBAN 9656 So. Merrion Ave., Chicago 17, III. Telephone: SA 1-3442

UNUSUAL BARGAIN

Detrex stainless steel Kem-O-Dryer. Model PD-750. Size 200-1-3. Equipped for gas or steam. Nearly new. \$785.00 takes it.

GRAND TRAVERSE METAL CASKET CO. Traverse City, Michigan

METALLIZING NON-CONDUCTORS

\$2.00 Per Copy Book Orders Payable in Advance

Metal Finishing

381 Broadway, Westwood, N. J.

BOOKS ON FINISHING

Send for List METAL FINISHING

381 Broadway

Westwood, N. J.

Per column inch per insertion \$12.00 3 times -11.00 10.00 6 times -

Yearly (12 times)

READY REFERENCE SECTION

POLISHING AND BUFFING ANODIZING RUSTPROOFING PLATING BARREL FINISHING VACUUM METALIZING . LACQUERING AND ENAMELING

SITUATIONS OPEN

9 00

SITUATIONS WANTED

SALES ENGINEERS

SALLES ENUIVELERS
SITUATIONS OPEN—qualified to sell Metal Cleaning Equipment. Vapor Degressers — Alkaline and Phosphate Washers — Agitating Washers — Ultrasonic Cleaning Equipment — Trichlorethylene and Perchlorethylene Degressing Solvents. Complete training program at factory but only men with experience or knowledge in this field or related fields need apply.

51 Terminal Ave. Clark, N. J.

POLISHING AND PLATING EXECUTIVE

SITUATION WANTED — Twenty-one years actively engaged, diversified experience with precious and non-precious metals. Administrative ability. Plant manager. Address: February 3, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATING FOREMAN

SITIATION FOREMAN

SITIATION WANTED—Age 31, 11 years of diversified job shop plating experience, which includes made the properties of the

GRADUATE CHEMIST

SITUATION OPEN - For research and development on metal finishing compounds, cleaners, conversion coatings, etc. Pleasant working conditions in labora-tory of well-established leader in this field. Location, N.Y.C. area. Prefer man of about 30 years with five years plating experience. Address: February 1, care Metal Finishing, 381 Broadway, Westwood, N. J.

ELECTROPLATING ENGINEER

SITUATION WANTED — Graduate engineer, 20 years industrial, laboratory and development experience in almost all phases of metal finishing including precious metals, corrosion. Cost conscious planning, control of processes, trouble shooting, equipment design. Adequate position wanted in metropolitan New York area. Address: January 5, care Metal Finishing. 381 Broadway, Westwood, N. J.

PLANT MANAGER

SITUATION WANTED—Professional management engineer with graduate degree in Chemical Engineering desires position as plant manager. Wide experience in plating and plating plant management. Address: January 7, care Metal Finishing, 381 Broadway, Westwood NI

SALES ENGINEER

SALES ENGINEER
SITUATION OPEN—Experienced salesman well versed in the electroplating field, with a knowledge of chemicals and processes. Area available in metropolitan New York. Send in resume of experience and past earnings. Employees notified. Address: March 2, care Metal Finishing, 381 Broadway, Westwood, N. J.

ELECTROPLATING ENGINEER

SITUATION WANTED—Graduate engineer, with 20 years experience in almost all phases of metal finishing including precious metals, analytical control, trouble shooting, planning and equipment design. Position wanted in metropolitan New York area. Address: March 3, care Metal Finishing, 381 Broadway, Westwood N. I.

JOB SHOP TO MANAGE

SITUATION WANTED—Job shop to manage on percentage basis or with option to buy-Twenty years experience in the plating field on all metals. Replating of auto bumpers, ano-dizing and production runs, Government speci-fication plating, Married man, 39 years of age. Address: March 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

COMING EVENTS

AMERICAN ELECTROPLATERS' SOCIETY

LOS ANGELES BRANCH

MARCH 21, 1959
Annual Educational Session and Dinner Dance, Beverly Hilton Hotel, Los Angeles, Calif.

TRI-STATE

APRIL 4, 1959

Fifth Tri-State Regional, Louisville Host Branch, Louisville,

BALTIMORE-WASHINGTON

APRIL 11, 1959
Golden Jubilee Banquet and Dance and "Order of Past Presidents" Award Ceremony, Washington, D. C.

EMPIRE STATE REGIONAL

APRIL 11, 1959
Buffalo Host Branch, Hotel Peter Stuyvesant, Buffalo, N. Y.

NEW ENGLAND REGIONAL

APRIL 18, 1959

Twentieth Regional, Waterbury Host Branch, Hotel Statler, Hartford, Conn.

MILWAUKEE BRANCH

APRIL 25, 1959

Annual Meeting and Banquet, Schroeder Hotel, Milwaukee,

BOSTON BRANCH

MAY 2, 1959

Annual Technical Session and Banquet, Hotel Statler, Boston, Mass.

ST. LOUIS BRANCH

MAY 2, 1959
Annual Banquet and Dance, Chase Hotel, Starlite Roof, St. Louis, Mo.

FIFTH INDUSTRIAL FINISHING EXPOSITION JUNE 15-19, 1959

Golden Jubilee Convention and International Exposition, Including Fifth International Conference on Electrodeposition and Metal Finishing; Convention Headquarters — Hotels Statler Hilton and Sheraton-Cadillac; Exposition - Artillery Armory, Detroit, Mich.

SUPPLIERS OF EQUIPMENT AND MATERIALS AND ADVERTISERS INDEX

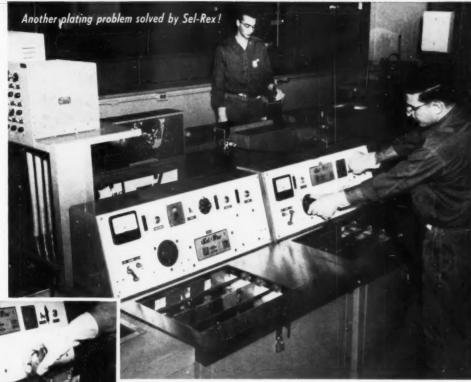
Abbay Brassa Automotion Inc	40
Abbey Process Automation, Inc. 37-01 48th Ave., Long Island City 1, N. Y Acme Manufacturing Co. 1400 E. 9 Mile Rd., Detroit 20 (Ferndale),	34
1400 E. 9 Mile Rd., Detroit 20 (Ferndale),	Mich.
11-13 43rd Rd., Long Island City 1, N. Y	102
Congress Expressway & S. Kolmar Ave., Chicago 24, III.	100
2041 S. Davie Ave., Los Angeles, Calif.	30
2041 S. Davie Ave., Los Angeles, Calif. Allied Research Products, Inc. 4004 E. Monument St., Baltimore 5, Md.	30
Alsop Engineering Corp. 1402 Bright St., Milldale, Conn. American Agile Corp. 5461 Dunham Rd., Maple Heights, Ohio	
American Agile Corp. 5461 Dunham Rd., Maple Heights, Ohio	97
Weterbury 20 Conn	
American Buff Co.	10
Ampco Metal, Inc.	99
Ampco Metal, Inc. 1945 So. 38th St., Milwaukee 46, Wis. Apothecaries Hall Co., Div. of The Hubbard-Hall Chemical C 22 Benedict St., Waterbury 20, Conn. Armitage & Co., John L. 245 Thomas St., Newark S, N. J.	e. 20
22 Benedict St., Waterbury 20, Conn.	
245 Thomas St., Newark 5, N. J.	
Docon reil Co.	113
	112
564 E. First St., So. Boston 27, Mass. Baker Co., Alan 180 Sylvester Rd., South San Francisco, Ca Baker Co., The M. E. Combridge 38, Mass.	
Baker Co., The M. E. 25 Wheeler St., Cambridge 38, Mass.	94
25 Wheeler St., Cambridge 38, Mass. Barker Bros., Inc. 1660 Summerfield St., Brooklyn 27, N. Y.	
Beam-Knodel Co. 195 Lafayette St., New York 12, N. Y. Beck Equipment Co. 3350 W. 137th St., Cleveland 11, Ohio	108
Beck Equipment Co.	
Belke Manufacturing Co.	12
Better Finishes & Coatings, Inc.	83
Belke Manufacturing Co. 947 N. Cicca Ave. Chicago 51, III. Better Finishes & Gatings, Inc. 268 Doremus Ave. Newark 5, N. J. Blakeslee & Co. G. S. Chicago 50 III.	84
1844 S. Laramie Ave., Chicago 50, III. Brucar Equipment & Supply Co.	114
Brucar Equipment & Supply Co. 602-604 20th St., Brooklyn, N. Y. Buckingham Products Co.	
Buckingham Products Co. 14100 Fullerton Ave., Detroit 27, Mich. By-Buk Co. 4314 W. Pico Blvd., Los Angeles 19, Cali Chandeysson Electric Co. 4074 Bingham Ave., St. Louis 16, Mo.	100
4314 W. Pico Blvd., Los Angeles 19, Cali Chandevsson Electric Co.	1.
4074 Bingham Ave., St. Louis 16, Mo.	107
Chem-Salts, Inc. P. O. Box 2803. Sta. D, Atlanta 18, Ga. Chemical Corp., The	89
Chemical Corp., The 58 Waltham Ave Springfield 9, Mass. Churchill Co., Inc., Geo. R. Hinaham, Mass.	32
Hingham, Mass.	
Ciba Co., Inc. 627 Greenwich St., New York 14, N. Y. Cincinnati Cleaning & Finishing Machinery Cincinnati Alexandry (Cincinnati 4) Ohio	Co.
Circo Equipment Co. 51 Terminal Ave., Clark Twp. (Rahway).	N. J.
Clair Manufacturing Co., Inc. Olean, N. Y.	
1965 E. 57th St., Cleveland 3, Ohio	
Clinton Supply Co.	112
112 S. Clinton St., Chicago 6, III. Cohn Mfg. Co., Inc., Sigmund 121 S. Columbus Ave., Mt. Vernon, N. Y.	93
Columbia-Southern Chemical Corp. One Gateway Center, Pittsburgh 22, Pa.	11
Conversion Chemical Corp.	86
100 E. Main St., Rockville, Conn. Crown Rheostat & Supply Co.	6
Davies Supply & Mfg. Co.	
m : W D - 4 - 4 - 6 -	90
135 W. 29th St., New York 1, N. Y.	105
Dawe's Laboratories, Inc. 4800 S. Richmond St., Chicago 32, IIII. Deering, Milliken & Co., Inc. 1045 Sixth Ave., New York 18, N. Y.	
1045 Sixth Ave., New York 18, N. Y.	79
Per 501 Detroit 32 Mich	
9301 French Rd Detroit 13 Mich	106
DeVilbiss Co., The Toledo I. Ohio	80, 81
Dixon & Rippel, Inc. Box 116, Saugerties, N. Y.	
Dow Chemical Co., The	18, 19
Midland, Mich. Du-Lite Chemical Corp.	69
6 River Rd., Middletown, Conn.	38, 39
Wilmington 98, Del. Electro-Glo Co.	
621 S. Kolmar Ave., Chicago 24, III.	

Engelhard Industries, Inc., Chemical Div.
113 Astor St. Newark 2 N. I
Enthone, Inc. 442 Elm St., New Haven 11, Conn. Federated Metals Div., American Smelting & Refining Co.
Refining Co. 120 Broadway, New York 5, N. Y. Formax Mfg. Corp. 3171 Bellevue, Detroit 7, Mich. Frank, Paul. 118 E. 28th St., New York 16, N. Y.
3171 Bellevue, Detroit 7, Mich. Frank, Paul
118 E. 28th St., New York 16, N. Y. G. S. Equipment Co. 15583 Brookpark Rd., Cleveland 35, Ohio Graver Water Conditioning Co. 216 W. 14th St., New York 11, N. Y. Grav-I-Fib Corp.
Graver Water Conditioning Co.
Grav-i-Flo Corp.
Gravi-File Corp. 400 Norwood Ave., Sturgis, Mich. Grieve-Hendry Co., Inc. 1421 W. Carroll Ave., Chicago 7, III.
Gumm Chemical Co., Inc. Frederick
538-542 Forest St., Kearny, N. J. Hamilton Emery & Corundum Co. 11 Chester, Mass.
Chester, Mass. Hammond Machinery Builders, Inc. 1601 Douglas Ave., Kalamazoo 54, Mich.
Hammond Solvents Recovery Service 241 Brunswick St., Hammond, Ind.
Handy & Harman
Hanson-Van Winkle-Munning Co.
Handy & Harman 82 Fulfon St., New York 38, N. Y. Hanson-Van Winkle-Munning Co. Matawan, N. J. Hardwood Line Mfg. Co. 2022 N. California Ave., Chicago 47, III.
2022 N. California Ave., Chicago 47, III. Harrison & Co., Inc. 487 Groveland St., Haverhill, Mass. Harshaw Chemical Co., The 1945 E. 97th St., Cleveland 6, Ohio Heatboth Corp. Springfield I. Mass. Heil Process Eauipment Corp.
Harshaw Chemical Co., The
Heatbath Corp.
Heil Process Equipment Corp.
12901 Elmwood Ave., Cleveland 11, Ohio Holland & Sons, Inc., J. 485 Keap St., Brooklyn 11, N. Y.
Hooker Chemical Corp.
Hooker Chemical Corp. 1302 Union St., Niagara Falls, N. Y. Hull & Co., Inc., R. O. 1301 Parsons Ct., Rocky River 16, Ohio Ideal Chemical Co.
Ideal Chemical Co.
Illinois Water Treatment Co.
Ideal Chemical Co. 1499 Dean Dr., So. Euclid 21, Ohio Illinois Water Treatment Co. 840 Cedar St., Rockford. III. Industrial Filter & Pump Mfg. Co. 5906 Ogden Ave., Chicago 50, III.
89 Commerce Rd., Cedar Grove, N. J. Infilco, Inc. P. O. Box 5033, Tucson, Ariz.
International Rectifier Corp.
1521 E. Grand Ave., El Segundo, Calif. Ionic Electrostatic Corp. 105-119 Monroe St., Garfield, N. J.
Jelco Finishing Equipment Corp.
153 E. 26th St., New York 10, N. Y. Kocour Company
153 E. 26th St., New York 10, N. Y. Kocour Company 10 4802 S. St. Louis Ave., Chicago 32, III. Kosmos Electro-Finishing Research, Inc. 11 140 Liberty St., Hackensack, N. J. Kushner, Dr. Joseph B. 11 2509 Washington Ave., Evansville, Ind. Land, Inc., L. J. Land, L. J. La
140 Liberty St., Hackensack, N. J. Kushner, Dr. Joseph B.
2509 Washington Ave., Evansville, Ind.
r. O. box 007, weendwken, N. J.
2820-38 Lasalle St. St. Louis 4 Mo.
16 Cherry Ave Waterbury 20 Conn
Lea Michigan, Inc. 14066 Stansbury Ave., Detroit 27, Mich. Lea-Ronal, Inc.
139-70 109th Ave. Jamaica 35 N Y
L'Hommedieu & Sons Co., Chas. F. 4521 Ogden Ave., Chicago 23, III. Lindale Equipment & Supply Corp. 504 Smith St., Brooklyn 31, N. Y.
504 Smith St., Brooklyn 31, N. Y.
Losey Co., Arthur H. 110 S. Horton St., Jackson, Mich. Lowe Brothers Co., The
Macarr, Inc. 2543 Boston Rd., Bronx 67, N. Y.
MacDermid, Inc. Waterbury 20, Conn. Back Cov
Magnus Chemical Co., Inc.
Mahon Co., The R. C. Detroit 34, Mich.
Monhattan Rubber Div.
Roybestos-Manhattan, Inc. 6 Willett St., Passaic, N. J. Manning, Maxwell & Magre, Inc.
Manning, Maxwell & Moore, Inc. Consolidated Ashcroft Hancock Div. Stratford, Conn.
Meaker Company, The

Makel Einich I	
Metal Finish, Inc. 408 Frelinghuysen Ave., Newark, N. J.	
	42
Rahway, N. J. Motor Repair & Mfg. Co., The 1555 Hamilton Ave., Cleveland 14, Ohio	113
P. O. Boy 180 Monto Pd. E. Rismingham Mi	26
National Polymer Products, Inc.	17
National Polymer Products, Inc. Reading, Po. Nazer Rubber Co., The 2727 Avondale, Toledo 7, Ohio New Hollond Machine Co.	107
New Holland Machine Co.	
	14
Nordson Corp. Jackson St., Amherst, Ohio Northwest Chemical Co. 9310 Roselawn Ave., Detroit 4, Mich.	
9310 Roselawn Ave., Detroit 4, Mich.	31
Norton Co. 1 New Bond St., Worcester 6, Mass. Nuodex Products Co.	-
	13
Oakite Products, Inc. 18 Rector St., New York 6, N. Y. Octagon Process, Inc.	4
15 Bank St., Staten Island 1, N. Y.	
Packer Machine Co.	
496 Center St., Meriden, Conn. Pennsalt Chemicals Corp. 3 Penn Center Plaza, Philadelphia 2, Pa. Pesco Plating Equipment Corp. 75 Wythe Ave., Brooklyn 11, N. Y. Pfizer & Co., Inc., Chas. 630 Flushing Ave., Brooklyn 6, N. Y. Phelps Dodge Refining Corp. 300 Park Ave., New York 22, N. Y. Plating Products, Inc. 1509 N. Washington, Kokomo, Ind. Plating Service & Engineent Corp. 112	
Pesco Plating Equipment Corp.	112
Pfixer & Co., Inc., Chas.	27
630 Flushing Ave., Brooklyn 6, N. Y. Phelps Dodge Refining Corp.	
300 Park Ave., New York 22, N. Y.	95
1509 N. Washington, Kokomo, Ind. Plating Service & Equipment Corp. 112.	
3670 Hart St. Datroit 14 Mich	
807 Edgewater Rd. New York 59 N. Y.	103
92 N. 12th St., Carlstadt, N. J.	104
Rapid Electric Co. 2881 Middletown Rd., Bronx 61, N. Y. Raybestos-Manhattan, Inc.	7
Raybestos-Manhattan, Inc. Manhattan Rubber Div.	
Passaic, N. J.	
633 Richmond St., Grand Rapids 4, Mich. Robertshaw Fulton Controls Co.,	113
Fulton Sylphon Div.	78
Knoxville 1, Tenn. Rona Laboratories, Inc.	
Rona Laboratories, Inc. E. 21st & E. 22nd Sts., Bayonne 3, N. J. Sandoz, Inc. 61 Van Dam St., New York 13, N. Y. Saran Lined Pipe Co.	
61 Van Dam St., New York 13, N. Y.	
Schaffner Mfg. Co., Inc. 22 Herron Ave., Emsworth, Pittsburgh 2, Pa.	109
8-11 43rd Rd., Long Island City 1, N. Y.	
Sel-Rex Corp. Inside Back C 75 River Rd., Nutley 10, N. J.	over
Service Screw Products Co.	
Sernco Mrg. Co.	101
Siefen Co., J. J. 5643 Lauderdale, Detroit 9, Mich. Solvay Process Div., Allied Chemical Corp. 61 Broadway, New York 6, N. Y. Solvents Recovery Service	92
Solvay Process Div., Allied Chemical Corp.	29
61 Broadway, New York 6, N. Y. Solvents Recovery Service	
Solvents Recovery Service 1025 Broad St. Nework 2, N. J. Sommers Bros. Mfg. Co. 3439 No. Broadway. St. Louis 7, Mo. Stevens, Inc., Frederic B. 1808 - 18th St., Detroit 16, Mich. Stokes Corp., F. J.	110
3439 No. Broadway, St. Louis 7, Mo.	
1808 - 18th St., Detroit 16, Mich.	15
3300 Idbor Kd., Philadelphia 20, Pa.	88
Storts Welding Co., Inc. 38 Stone St., Meriden, Conn.	102
38 Stone St., Meriden, Conn. Stutz Co., The 4430 W. Carroll Ave., Chicago 24, III.	96
Surety Rubber Co. Carrollton, Ohio	
	41
39 Snow St., Providence, R. I. True Brite Chemical Products Co.	92
P. O. Box 31, Oakville, Conn. Udvlite Corp., The	8, 9
True Brite Chemical Products Co. P. O. Box 31, Oakville, Conn. Udvlite Corp., The Detroit 11, Mich. Unit Process Assemblies, Inc. 61 East 4th St., New York 3, N. Y. U. S. Galvanizing & Plating Equipment Corp. 31 Heyward St., Brooklyn 11, N. Y. U. S. Stoneware Akron 9, Ohio Univertical Foundry & Machine Co. 14841 Meyers Rd., Detroit 27, Mich. Worthy Products Co. Box 123, Temple, Pa. Wyandotte Chemicals Corp. Wyandotte, Mich.	104
61 East 4th St., New York 3, N. Y.	. 0-4
31 Heyward St., Brooklyn 11, N. Y.	0.5
Akron 9, Ohio	82
14841 Meyers Rd., Detroit 27, Mich.	101
Worthy Products Co. Box 123, Temple, Pa.	114
Wyandotte Chemicals Corp. Wyandotte, Mich.	33
Zialite Corp.	108

marina removement, 1909

119



IBM Plating operator removes printed wiring board from Sel-Rex Jet Plater where it has been plated with Sel-Rex Bright Gold. The Jet Platers assure optimum conditions for the electrodeposition of Sel-Rex Bright Gold for this exacting application.



Heart of the SAGE System is the 275 ton IBM computer, one of the world's largest and most reliable. Shown here are some of the computer frames containing pluggable electronic units that perform the data processing involved in solving air defense problems.

SEL-REX BRIGHT GOLD AND 4 JET PLATERS HELP PROVIDE "BUILT-IN" RELIABILITY TO IBM SAGE COMPUTER

When it comes to protecting our country from possible surprise air-attack, only the best, most reliable instruments and equipment will do. Understandably, IBM was chosen to build the 275 ton computer pictured in part at the lower left, which is the heart of our SAGE System. The SAGE computer performs millions of computations at lightning speed, and continuously checks them—automatically.

Approximately 7,300 pluggable units containing printed card assemblies are used in this computer. Needless to state, the proper functioning of these units is essential. Sel-Rex Bright Gold, in four Jet Platers, is used in the manufacture of the IBM SAGE computer, and other military equipment under development. Built-in reliability—for which IBM equipment is famous the world over—assures us all of constant electronic watchfulness 24 hours a day.

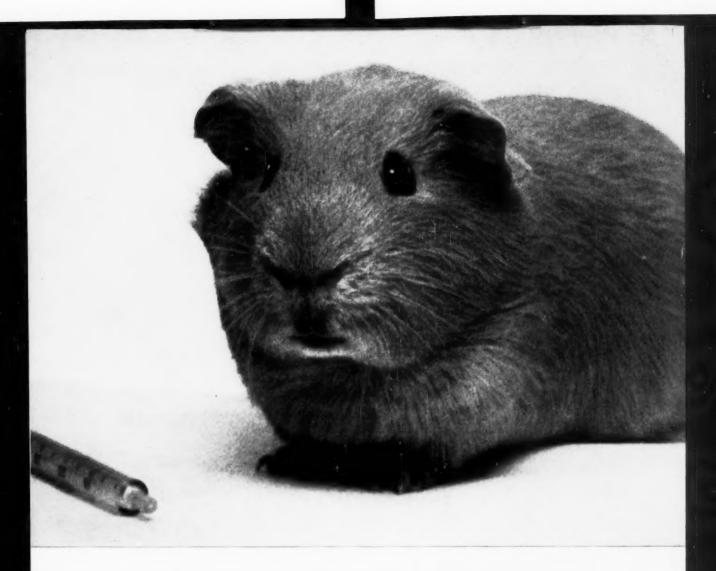
Sel-Rex can offer built-in reliability to your product through the unique metallurgical properties of a precious metal—or by designing plating or metal finishing equipment to your specific requirements...from a single piece of equipment to a complete facility. Our latest catalog—#CHP—gives details.



SEL-REX CORPORATION

NUTLEY 10, NEW JERSEY

Manufacturers of Exclusive Precious Metals Processes, Metallic Power Rectifiers, Airborne Power Equipment, Liquid Clarification Filters, Metal Finishing Equipment and Supplies.



THE CUSTOMER WHO TRIED AN EXPERIMENT

Once there was a customer who was a guinea pig. He was a good-natured guinea pig and cooperated with a supplier who wanted to use his production line to try out a new product. Well...he tried it, and it didn't work. Practically ruined his good-nature. Not to mention his production line and his profit statement. Moral: Don't let anyone use you for a guinea pig; don't let anyone experiment on your production line. Be certain the metal finishing products you buy have been

thoroughly tested before they come through

your receiving room door.

MacDermid moves slowly and cautiously with a new product. From the research lab, each new product is picked up by an experienced product service engineer and thoroughly field tested under actual operating conditions until the "bugs" are out. If they aren't, you'll never know about it!

lacDermid ...right to the Finish!

MacDermid Incorporated Waterbury, Connecticut, PLaza 4-6161 Ferndale, Detroit, Michigan, Lincoln 5-0064 MacDermid Pacific, Torrance, California, DAvis 3-6292